Metals Review

VOLUME XXI •• No. 2 FEBRUARY 1948

WELDING AND WELDABILITY ISSUE

Featuring

Arc Welding and Resistance Welding

By P. J. Rieppel

Asst. Supervisor, Welding Research Div.

Battelle Memorial Institute

Present status as reported by recent literature (with reference to source numbers in the Review of Current Metal Literature).

Welding Equipment

Manufacturers announce 127 new products and processes for arc, resistance and gas welding, cutting, brazing, soldering and hard surfacing, developed during past six months.

NOTABLE LECTURES

Reported This Month

A. R. Lytle describes a weldability test procedure that incorporates all of the variables that influence ductility . . . R. A. Aborn suggests a new approach to weldability by differentiating between the making of a weld (weldability, as judged by underbead crack test, double-T test, and restraint test) and weld performance (as judged by tensile, impact and slow bend test) . . . Arthur N. Kugler shows expanding uses of inert-gas arc welding and emphasizes necessity for purity of the gases . . . Ray McBrian cites many metallurgical problems imposed by the railroads' trend toward larger locomotives, higher speeds and greater factors of safety . . . George Dinges, with a background of 20 years in electroplating, tells about newer applications in such fields as electrorefining and electroforming.

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NEXT MONTH— METALWORKING (MACHINING AND SHAPING)

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METALS REVIEW

7301 Euclid Avenue Cleveland 3, Ohio

Metals Review

Vol. XXI, No. 2

Published monthly by the American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio; Francis B. Foley, President; Harold K. Work, Vice-President; William H. Eisenman, Secretary; E. L. Spanagel, Treasurer; Arthur E. Focke John E. Dorn, E. G. Mahin, C. M. Carmichael, Trustees; Alfred L. Boegehold, Past President. Subscriptions $5.00 per year ($6.00 foreign). Single copies $1.00. Entered as Second Class Matter, July 26, 1930, at the Post Office at Cleveland, Ohio, under the Act of March 3, 1879.

February 1948

RAY T. BAYLESS, Publishing Director MARJORIE R. HYSLOP, Editor GEORGE H. LOUGHNER, Production Manager

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AMERICAN SOCIETY FOR METALS

A.S.M. Review of Current Metal Literature

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1 ORE BENEFICIATION

1a — General

1a-1. Crushing and Grinding. Lincoln T. Work. *Industrial and Engineering Chemistry*, v. 40, Jan. 1948, p. 9-10.

Reviews literature published in 1947. 30 ref.

1a-2. Flotation. J. Bruce Clemmer. *Industrial and Engineering Chemistry*, v. 40, Jan. 1948, p. 28-32.

Reviews 1947 literature. 58 ref.

1a-3. Sedimentation and Hydraulic Classification. Anthony Anable. *Industrial and Engineering Chemistry*, v. 40, Jan. 1948, p. 50-52.

Reviews 1947 developments. 13 ref.

1b — Ferrous

1b-1. Iron Ore Beneficiation at Josephine Mine. Chas. A. Hames. *Canadian Institute of Mining and Metallurgy, Transactions*, v. 50 (Bound with *Canadian Mining and Metallurgical Bulletin*), Dec. 1947, p. 637-656.

The deposit is a siliceous hematite, with silica present as fragments of cherty quartz. Preliminary test work, equipment, and flow sheets. Details of crushing, screening, conveying, jigging, dewatering, stockpiling, reclaiming, sampling, assaying, treatment costs, personnel, and marketing of concentrates and lump ore. The Hames lump-ore, heavy-media separator and its operation.

For additional annotations indexed in other sections, see: 25b-8.

1c — Nonferrous

1c-1. Northwest Magnesite's HMS Plant. *Mining World*, v. 9, Dec. 1947, p. 18-22.

Heavy-media separation plant and procedures.

1c-2. Can Mexico's Tin Industry Be Modernized? R. M. Atwater, Jr. *Engineering and Mining Journal*, v. 149, Jan. 1948, p. 74-77.

Problems involved in introduction of modern mining and concentration methods.

2 SMELTING, REDUCTION & REFINING

2a — General

2a-1. Industry's Debt to Industrial Gases. *Sheet Metal Worker*, v. 38, Dec. 1947, p. 53-54, 84.

Experiments with the use of oxygen to speed up melting operations in steel production and to remove stainless steel surface defects. Use of inert gases in the welding of magnesium, aluminum, copper and other metals and alloys difficult to weld.

2a-2. Metal Production. *Steel*, v. 122, Jan. 5, 1948, p. 258, 260, 262-263, 266, 268-270, 272-280, 283-285.

Brief reports on recent developments: New Developments in Lead Hindered by Heavy Demands, by Robert L. Ziegfeld; War Materials and Processes Find Many Civilian Uses, by L. W. Townsend; Service Conditions Accelerate Trend to Basic Refractories, by R. E. Birch; Suspended Roof Designed to Conserve Heat, by L. C. Hewitt; Copper and Brass Industry Uses High Production Unit, by D. K. Crampton; Aluminum Only Metal Cheaper Today Than Before the War, by David P. Reynolds; Economic Use of Heat Faces Blast Furnace Operators, by Charles E. Agnew; Wide Use for Stainless Clad Steel Is Predicted, by John R. Townsend; Stainless Producers Find Powder-Cutting Process Versatile Tool, by D. H. Fleming, Jr.; Operates Modern Laboratory for Testing Fireclay, by Britton T. Day; Develops Gun for Maintenance of Brickwork Above Slag Line, by Harvey N. Barrett; Advancements to Refine Production of Magnesium Alloys, by Charles E. Nelson; Concrete Reinforced Steel Advocated for Buildings, by Arthur A. Schwartz; High Purity Silica Brick Gives Increased Service Life, by S. M. Swain; High-Pressure Blowing Effects Reduction in Coke Rate, by Ralph H. Sweetser; Pig Iron Producers Struggle to Meet Demand, by Wilfred H. White; Use of Oxygen in Steelmaking Yields Constructive Data, by George V. Slottman; Oxygen Cutting Technique Boosted by Hot Cutoff Operations, by R. S. Babcock; Lancing Operations Cause Decided Rise in Temperature, by L. D. Culp; Sees Strong Indications of Return to Standard Steels, by Charles M. Parker; Cold Charging Is Bottleneck in Most Openhearth Plants, by J. S. Marsh; High-Temperature Corrosion Resistant Steel Developed, by C. A. Crawford; What Does Next Decade Promise by Way of Improvements? by John S. Unger; Trends in Steel Industry Swing Toward Refinements, by L. F. Reinartz; Coal Washing Facilities May Bring Needed Relief, by C. D. King; Oxidation Resistant Steels Conditioned by Powder Scarfing, by E. M. Holub; Flame Cutting Integrated With Rolling Mill Operations, by R. F. Helmkamp; Controls Furnace Operation by Temperature of Product, by Fred S. Bloom; Oxy-Acetylene Cutting Speeds Ship-Scrapping Operations, by B. H. Acomb; Large Sintering Facilities Required for Agglomeration, by W. J. Urban; Studies All-Basic Openhearth as Means of Increasing Output, by A. K. Moore; Powdered Iron Molding Used in Television Transformer Cores, by C. T. Martowicz; Oxygen Practice Still in Experimental Stage, by J. L. Schueler; More Designers Rely on Zinc Die-Casting Process, by R. Davison; Sees Undiscovered Possibilities for Oxygen in Openhearths, by J. H. Janssen; Use of Chromium-Silicon Steels for Springs Is Increasing, by F. P. Zimmerli; Decided Swing Toward Moly and Tungsten Steels Noted, by Norman F. Tisdale; Steel Oxygen Requirements Depend on Extent of End-Use, by J. H. Zimmerman; All-Basic Openhearth Is Proving Economical, by R. P. Heuer; Oxygen Has Many Uses in Iron and Steel Industry, by Frank E. Pavlis; Copper and Brass Products Improved by New Controls, by Herman W. Steinkraus; Experimental Work on Fusion Piercing Iron Ores Continues, by R. B. Aitchison; Anticipates Modernization Programs in Near Future, by A. L. Thurman; Large Hearth Blast Furnaces May Produce 1500 Tons, by Owen R. Rice; Engineers Turn Attention to Merchant Mill Improvements, by G. G. Beard; Increased Use of Modified Malleable Iron Observed, by R. J. Cowan; Improved Production Method Used by Wire Industry, by Henry C. Boynton; Patents Indicate New Trend in Wrought Zinc-Base Alloys, by Oscar E. Harder.

2b — Ferrous

2b-1. Practical Experience With the Use of Oxygen in Steelmaking. G. V. Slottman. *Journal of the Iron and Steel Institute*, v. 157, Nov. 1947, p. 331-336.

Experiences in the U. S. with the oxygenated-oil firing of openhearth furnaces and the use of oxygen as a bath reagent.

2b-2. Openhearth Charging Delays and Their Effect on Steel Production. John A. Warchol, Jr. *Blast Furnace and Steel Plant*, v. 35, Dec. 1947, p. 1479-1481.

Practical factors which should be investigated to insure minimum charging time; recommendations. (Presented at meeting of the Eastern Section of the National Open Hearth Committee, Philadelphia, Oct. 7, 1947.)

2b-3. Basic Openhearth Slag Control. (Concluded.) Part V. The Important Constituents of Basic Openhearth Slags and Some of Their Outstanding Properties. Charles R. Funk. *Blast Furnace and Steel Plant*, v. 35, Dec. 1947, p. 1490-1497, 1537.

Includes photomicrographs which show appearance of some of the constituents and their distribution in the slags.

2b-4. Oxygen and the Combustion Process. William A. Mueller. *Engineering Experiment Station News* (Ohio State University), v. 19, Dec. 1947, p. 21-24.

Fundamentals of the use of nearly pure oxygen for oxidation of carbon in steel furnaces as compared with use of air. Dissociation heat losses and thermal capacities are plotted vs. temperatures.

2b-5. Efficiency of Fireclay Hot Tops in Steel Ingot Casting. J. W. Mueller. *Engineering Experiment Station News* (Ohio State University), v. 19, Dec. 1947, p. 47-48.

Experimental work on different types of fireclay hot-top materials in an attempt to reduce head-end steel ingot croppage.

2b-6. High Pressure Operation; Full Scale Blast Furnace Trials. J. H. Slater. *Iron and Steel*, v. 20, Dec. 1947, p. 653-657.

Previously abstracted from *Blast Furnace and Steel Plant*. See 2-234 and 2-255, R.M.L., v. 4, 1947 (*Metals Review*, Oct. and Nov. 1947).

2b-7. Melting Steel and High-Duty Irons in an Oil-Fired Rotary Furnace. W. J. Roscrow. *Foundry Trade Journal*, v. 83, Dec. 11, 1947, p. 303-305.

Operating details of a 30-cwt. oil-fired Stein & Atkinson rotary furnace.

2b-8. Kinetics of Carbon Elimination From the Steel Bath. (In Russian.) L. A. Shvartsman, A. M. Samarin, and M. I. Temkin. *Zhurnal Fizicheskoi Khimii (Journal of Physical Chemistry)*, v. 21, Sept. 1947, p. 1027-1032.

The investigation was conducted under very simple conditions; namely, in the absence of slags and with vigorous stirring of the molten metal, thus eliminating several sources of error. It was found that the rate of elimination is determined by the rate of carbon diffusion into the surface of the melt.

2b-9. Accelerating the Rate of Carbon Elimination of Openhearth Bath. J. N. Hornak. *Canadian Metals & Metallurgical Industries*, v. 10, Dec. 1947, p. 22-23.

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Arc Welding and Resistance Welding

Present Status as Reported by Recent Literature

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RECENT LITERATURE on arc welding has been focused on familiar topics such as electrode developments, weldability, welded structures research, inert-gas shielded-arc welding, and numerous applications of arc welding in production, maintenance and construction. Those interested in welding the higher strength steels have been concerned with cold cracking and the development and uses of low-hydrogen ferritic electrodes. The shipbuilding and other structural industries have contributed considerable information on weldability, design for arc welding, and the influence of temperature upon the service performance of welded structures. The know-how of inert-gas shielded-arc welding has increased with its greater use. Numerous applications of arc welding have furthered the production of more, better, and lower-cost products.

Electrode Developments

Research during and since the war has greatly increased knowledge about cold cracking (underbead cracking) in the heat-affected base metal of metal-arc welds, especially in the higher strength steels. The incidence of cold cracking is influenced by the composition and processing of the steel and the hydrogen evolved by the electrode coatings during welding. This type of cracking can be eliminated by using low-hydrogen ferritic electrodes (22-167, March 1947)*. Nearly all electrode manufacturers have developed, or are developing, low-hydrogen electrodes (E6015).

Electrodes of this class do not, in general, operate so well as many of the E6010, E6012, and E6020 electrodes. However, they have other definite advantages in addition to crack elimination. Weld metal deposited by them can be enameled without the spalling of enamel from the weld and heat-affected zones. Porosity-free welds can be made on high-sulphur, free-machining steels. Some E6015 weld metals, at freezing temperature, have from two to three times the notch toughness values of other mild steel weld metals. The higher strength electrodes of this type (E8015) show promise for welding high-strength alloy steels and for parts that are heat treated after welding (22-163, March 1947; 22-624, Oct. 1947).

*Literature references are designated by the corresponding item number in the Review of Current Metal Literature rather than by repeating the entire title, author and source; the reader can get this information by referring to *Metals Review* for the month indicated.

Use of high-nickel electrodes for making machinable welds in cast iron, although not a development of the past year, has considerably increased and deserves mention. In a few instances, gray iron parts have been welded to steel or to other gray iron parts in production. Arc welding has also been used extensively for salvaging iron castings which are subsequently machined (22-235, May 1947). The art of welding heavy gray iron castings has been discussed under five headings: *(a)* metal-arc welding; *(b)* oxy-acetylene welding; *(c)* carbon-arc welding; *(d)* bronze welding; *(e)* thermit welding; and *(f)* burning (22-337, June 1947).

Weldability

Weldability of steels and other metals has received much attention ever since welding was first used to join metal parts, but it has been difficult to find a satisfactory definition of weldability. Some steels and other metals are readily weldable; others—especially the hardenable steels—are classed as nearly nonweldable by the old yardsticks, though even these steels respond to new techniques. Other steels and alloys cannot be arc welded, while many are classed as weldable when proper precautions are taken, but nonweldable without them. There is no single test that will provide an adequate understanding of the welding characteristics of a metal, nor one that will give a quantitative and qualitative evaluation of its weldability.

The welding characteristics of steels are vitally important to the metallurgist, designer and production man. It has been suggested that any method of determining the welding characteristics of metals, particularly high-strength steels, should include both an underbead-cracking susceptibility test and a welded-joint toughness test (22-223, April 1947). The latter should give a reasonably accurate idea of probable service performance of the base metal and joints in a weldment. Underbead cracking is not a very important factor in welding the common structural steels, but the ductility and toughness of the heat-affected base metal is the subject of constant attention. The heat-affected zone is a complex problem, since it contains metal with great variations in thermal treatments. Part of the zone—that adjacent to the weld metal—is heated during welding to above the upper critical temperature; the outer edge of the zone is heated up to or just below the lower critical; and zones of metal in between reach temperatures between these levels.

Important progress has been reported on fundamentals of underbead cracking and methods for controlling it (22-167, March 1947). The incidence of underbead cracking was found to be associated with the hydrogen produced in the arc atmospheres of coated electrodes, and, as mentioned above, controlling the hydrogen produced by electrode coatings has controlled underbead cracking.

The hydrogen content of welds in structural grades of steel does not appear to influence the ductility of welds and heat-affected zones in these steels. Stress-relieving the weldments, however, definitely improves ductility and notch resistance. Variations which occur from one heat to another of structural grades of steel greatly influence the notch sensitivity and ductility. The properties of unwelded plate are not reliable indicators of properties after the steel is welded (22-219, April 1947; 22-340, June 1947).

Two zones of low ductility were found by one investigator in hand-welded joints in firebox-quality steel, one at the weld center line and the other in the subcritically heated metal. Stress-relieving at 1150° F. restored ductility to the plate (22-645, Oct. 1947). Interest has usually been focused upon the heat-affected metal close to the fusion line of the welds, and the subcritically heated metal in weldments has received little previous attention. It appears that more studies should include this zone of the weld joints.

Considerable research is currently being conducted to obtain information on the properties of heat-affected zones of arc welds. As this information accumulates, it is likely that the weldability of structural grades of steel can be improved from the metallurgical point of view.

Welded Structures

Although arc welding has been used successfully for a number of years, its large-scale use for fabricating ships is relatively new. The demand for steel ships during the war advanced welding to the major process for their construction, largely replacing riveting. With this transition to welding, numerous problems have been encountered that required the immediate attention of both government agencies and industry. Such a major problem is the failure of welded merchant ships under varying atmospheric and loading conditions.

Various small laboratory specimens have given apparently excellent results in evaluating metallurgical and mechanical properties of steel plate. (As previously mentioned, this type of testing has also provided considerable information on the weldability of steels.) However, experience with ships and other structures has shown that the small laboratory specimens fail to predict how those steels will perform in large, rigid welded structures. Service records and tests of full-scale structures, such as hatch corners of ships, have shown the importance of testing full-scale specimens and the tremendous influence that design has on the performance of large weldments. Design modifications greatly increased the over-all strength of large, full-scale, welded structural components tested in static tension. Similar design modifications, incorporated on maritime vessels in service, have reduced the number of service failures.

Types of steels which gave years of satisfactory service in riveted structures have failed with brittle fractures in similar welded structures. Much higher stress concentrations occur at structural and other notches in welded structures than in the riveted structures. A combination of stiffness, stress raisers or notches, changes in temperature, and notch-sensitive steels results in cleavage failures.

Improvements in steel quality can improve toughness and reduce tendency to brittle failure at service temperatures. However, improvements in steel quality should not be relied upon solely, and, in the meantime, available materials must be employed. Therefore, improvements in design to reduce stress concentrations to a minimum should also be considered to effect immediate improvement (22-268, May 1947; 22-339 and 22-340, June 1947; 9-6, Jan. 1947).

In building construction, modern methods and materials have improved the economy of structural welding, but the building industry has been seriously handicapped in many communities by antiquated building codes. Some of the more progressive cities, however, are revising their structural codes with provisions for the use of welding (22-165, March 1947; 22-150, March 1947).

Designs for all-welded steel structures of various types mentioned in the literature include three and four-story office buildings, plants, storage facilities and show rooms. Emphasis has also been directed to the prefabrication of building assemblies on the ground at the building site and their subsequent installation as a unit. Low-alloy, high-tensile steels and electrodes permit the use of lighter sections by increasing the permissible unit stress. Other advantages of welding are lower construction costs which include labor, equipment and materials; ease of fabrication; and the minimum amount of maintenance required after completion (22-527, Sept. 1947; 3-22, Jan. 1947).

Fabricators of structural steel have expressed concern over the effects of priming paints on the weldability of steel if the paint is left intact during welding. Research to determine the effects of some red-lead base paints, red-lead mixed pigment paints, and some zinc chromate base paints, has indicated that, in general, satisfactory welds can be expected on steel with shop or field coats of these paints (a nominal thickness of about 1 mil) (22-719, Jan. 1948).

Perry J. Rieppel is a member of the welding research staff of Battelle Institute. He holds a Bachelor of Science degree from the Mansfield State Teachers College and has studied additionally at Cornell University and University of Buffalo. Before joining the Battelle staff in 1943, he served as a welding technician for the Curtiss-Wright Corp. He is a member of the American Society for Metals, the American Welding Society, and Sigma Xi, honorary society.

Inert-Gas Shielded-Arc Welding

The principles of shielding welding arcs and molten weld metal by inert atmospheres, helium or argon, have been known for many years. Interest in these principles was revived during the war by their successful application to magnesium alloys. In this process, a welding arc is maintained between a tungsten electrode (nonconsuming) and the workpiece. Inert gas is flowed around the tungsten electrode and thus shields the arc and weld pool from the air. Filler metal is added as in torch welding processes. Since this process was first accepted commercially for welding magnesium it has been widely used to weld other metals and alloys, such as stainless steel, high-carbon, high-silicon, and other alloy steels, aluminum, brass, Inconel, monel, everdur, and copper.

There has been considerable controversy over the best welding current for the process. At present, alternating current with superimposed high-frequency current, for arc stabilization, is generally accepted for welding aluminum and magnesium alloys. Direct current may be used for welding stainless and alloy steels and copper.

About twice as much helium is needed to shield the arc as argon, but the cost is about the same since argon costs about twice as much as helium. Argon has a definite advantage in that no flux is required when it is used with alternating current for welding aluminum and magnesium alloys. A cleaning action, which as yet is not clearly understood, occurs when argon is used with alternating current. The cleaning takes place during the part of the cycle when the electrode is positive.

During the past year, several companies have developed special units for inert-arc welding. This alone speaks for the future of the process. Torches for manual and automatic welding have gone through rapid stages of evolution as heavier and better equipment has been demanded. Water-cooled torches for currents up to 800 amp. are now in use for welding joints in heavy plates of aluminum.

Considerable attention has been paid to the effect that purity of the gases, argon and helium, has upon the quality of welds. High-purity gases give better results than those containing even relatively small amounts of contaminating gases, nitrogen, and water vapor.

Further uses of the process are expected in the fields of alloy steel welding, hard facing, and light-metal fabrication (22-265, May 1947; 22-220, May 1947; 22-524, Sept. 1947; 22-531, Sept. 1947).

Applications of Arc Welding

Numerous interesting and useful applications of arc welding have been reported during the year. Some of them are new to the welding industry, generally, but most of them are new to specific trades or industries. Typical examples are the maintenance applications of arc welding in the cement, meat packing, and paint industries (22-88, Feb. 1947; 22-93, Feb. 1947; 22-153, March 1947).

A novel and outstanding application of submerged-arc welding was made to cast integral bosses for threaded pipe connections on pressure vessels (22-636, Oct. 1947).

Resistance Welding—Equipment

Recent literature reflects growing interest in developing and applying spot, projection, and flash welding. Important advances in power-supply equipment to utilize three-phase power are greatly increasing the number of potential uses of resistance welding and the range of thicknes and areas of materials that can be welded. Previously unwelded or hard-to-weld materials are being joined by new techniques and heat-control equipment. Improved inspection and testing methods have widened the field of application for these welding processes.

Serious problems in supplying power arise from the fact that most resistance welding machines are single phase and operate at low power factor, usually below 30%, and have a high kva. demand for relatively short periods of time. These single-phase loads on a three-phase supply line cause disturbances in the voltage conditions. As material being welded is introduced into the throat of a single-phase machine, the secondary current decreases because secondary impedance increases. This causes decrease of heat in the weld and consequently poorer weld quality. Current-compensating devices are used to correct this condition.

These problems of power supply for single-phase machines have slowed the progress of resistance welding. A number of systems have been devised to make use of three-phase power to reduce the kva. demand on the power supply and improve the power factor.

One system of using three-phase current has a motor generator with a large flywheel for energy storage to reduce sudden loads on the power line. The motor operates on three-phase power and the generator delivers power to the welder at frequencies of 16⅔ cycles per sec. It is reported that the initial cost of this equipment is the major disadvantage.

Another system has a bank of series capacitors to change the power factor from around 30% to nearly unity. Required additional equipment, such as capacitors, auto transformers, high-voltage synchronous control equipment, discharge resistors, and over-voltage protective equipment, makes the original installation costly. This stored-energy type of equipment is excellent for welding aluminum, but is not very satisfactory for steel.

Another system known as the three-phase single-phase system allows the use of three-phase current for welding steel. In this apparatus, a three-phase power supply feeds a three-phase, six-tube rectifier which supplies direct current to the welding transformer. Another simpler machine, called the dry-disk rectifier machine, provides rectification action and transformation action on one iron core. The welding transformer is made with three separate windings and one low-voltage secondary for the welding circuit.

The battery-operated welding machine is another stored-energy device, in which the energy from rectified three-phase current is stored in water-cooled batteries. This system is useful where the slightest kva. demand will produce objectionable light flicker in a community.

These developments in three-phase equipment have lowered the power demand substantially. The line currents for three-phase systems are from ¼ to ⅙ of that found in single-phase spot welding machines having normal throat depths. The welding current remains the same when large or small sections are introduced into the throat. However, many improvements are still to be made in this field and alternating current single-phase machines are still used extensively for general-purpose welding (22-167, May 1947; 22-637, Oct. 1947; 22-635, Oct. 1947; 22-336, June 1947).

Spot Welding Techniques and Methods

For spot welding magnesium alloy sheet, a cleaning solution has been developed that gives satisfactory surface preparation at room temperature. It contains 10 or 20% chromic acid to which 0.05% anhydrous sodium sulphate (Na_2SO_4) is sometimes added.

When properly cleaned, three commercially available compositions of magnesium alloy sheet were readily spot welded by equipment commonly used (condenser discharge) for spot welding aluminum alloys. These welds had excellent shear strength consistency (22-260, May 1947).

Fouling of the electrode tips is a serious problem in spot welding magnesium alloys, particularly the soft 1.5% manganese alloy. Chemically prepared surfaces give much less trouble than mechanically prepared surfaces. Frequent reversal of the direction of current flow prolongs the useful life of the tips, because the pickup deposits always build up more rapidly on the positive electrode (22-493, Aug. 1947).

Unstressed spot welds in magnesium alloy sheet are not greatly affected by selective corrosion attack unless copper is transferred from the electrode. Stressed spot welds in these alloys are subject to stress-corrosion. Recommended heat treatments for alleviating this condition were found to give no improvement. However, stressing the welds for considerable periods before subjecting them to corrosive conditions improved resistance to stress-corrosion (6-346, 1947 volume).

Carbon steel products have been fabricated by spot welding for many years, but until recently no comprehensive reports have been published on the influence of steel compositions and properties upon the weld properties for the range of material thickness commonly used. Data are now presented on both heat treated and "as-made" spot welds in annealed, hot rolled and cold rolled carbon steels up to 0.5 in. thickness and containing up to 1.09% carbon. This information is valuable to fabricators for *(a)* selecting steels for spot welding applications, wherein no subsequent heat treatments of any kind are employed; and *(b)* determining when special controls and heat treating technique are needed for the higher carbon steels (22-647, Oct. 1947).

Spot welds in low-carbon steels were classed as A, B, and C on a basis of the weld time, electrode force, and current used in making welds. The quality of welds from Class A through Class C generally decreases. It is possible, by information reported, to predict the quality of spot welds produced in various thicknesses of low-carbon steels (22-66, Jan. 1947).

A general procedure has been reported for selecting optimum spot welding conditions for various thicknesses and types of steel plate. Control equipment and measuring techniques were developed in order that the welding conditions might be easily specified and consistently reproduced (22-648, Oct. 1947).

It was tentatively concluded from a study of the spot welding of scaled and rusted structural steel that satisfactory spot welds can be made on rust-free, scaled steel, with reasonable electrode life. Welds made in rusted, scaled steel have poorer consistency and the electrode deteriorates rapidly (22-341, June 1947).

All of the common metallurgical heat treatments, including grain refining, tempering and austempering, can be performed in the spot welding machine. With the proper treatment for a given material, great improvement results in the mechanical properties of the welds, especially in the hardenable steels. Heat treatment was found to improve shock resistance of welds (22-718, Jan. 1948; 22-498, Aug. 1947).

Projection and Flash Welding

Projection welding has also been used many years in the fabrication of low-carbon steel, but little information has been available on the fundamentals of its application. The process has some advantages over spot welding. More than one weld can be made at a single stroke of the machine. Electrode life is longer than in spot welding, because lower current density and pressure are used over a larger contacting surface. There are no indentations in the finished surfaces of projection welded components.

Some information on the effects of the projection size, weld time, electrode force, and welding current on weld formation was reported recently. Projection heights of 20 to 25% of the projection diameter produce satisfactory welds over a wider range of welding currents than lower projections. Spacing between projections should be 2½ times the diameter of the fused zone to prevent welds from merging. The strength of multiple welds increases with spacing between welds. Steel quality also influences the strength of welds (22-344, June 1947;

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Use of oxygen. (Condensed from paper presented at 1947 annual convention of the A.I.S.E., Pittsburgh, Sept. 22-25, 1947.)

2b-10. Melting Cast Iron in Crucible Furnaces. *Canadian Metals & Metallurgical Industries,* v. 10, Dec. 1947, p. 23.
Recommended procedures.

2b-11. Electric Ingot Method for Continuous Casting Alloys. L. E. Browne. *Steel,* v. 122, Jan. 19, 1948, p. 74-76, 78.
Absolute control of liquefaction and solidification by Kellogg's recently perfected metallurgical process is expected to solve many high-temperature problems. Improvements in high speed toolsteels and in machinability of Cr-Ni stainless are among the other advantages. The melting speed of a single-ingot machine is about 7½ lb. per min.

2b-12. Openhearth Problems. Charles R. FonDersmith. *Steel,* v. 122, Jan. 19, 1948, p. 85-86, 88.
Work being done to improve methods, material, and equipment. (Presented before Eastern Section, National Open Hearth Committee, A.I.M.E., Philadelphia, Oct. 17, 1947.)

For additional annotations indexed in other sections, see: 3b-2, 16b-3.

2c — Nonferrous

2c-1. The Mufulira Smelter, Northern Rhodesia. F. E. Buch. *Metals Technology,* v. 14, Dec. 1947, T.P. 2248, 13 pages.
Smelter is designed for production of 10,000 short tons of blister copper per month. Major units comprise two reverberatory furnaces; three 13x30-ft. Pierce-Smith converters; two straight-line casting machines, one served by a 13x30-ft. holding furnace and the other by a ladle-tilting quadrant; two converter aisle cranes; and two converter blowers. It treats a wet flotation concentrate containing approximately 53% Cu, 0.9% oxide copper. The necessity for eliminating bismuth which occurs as an impurity in the ore is responsible for most of the unusual problem discussed.

2c-2. Roan Antelope Smelter, Northern Rhodesia. R. J. Stevens. *Metals Technology,* v. 14, Dec. 1947, T.P. 2249, 18 pages.
Several uncommon features of operation are: the high grade of concentrate treated (about 50% Cu); the high-flux burden on the charge, necessary because of deficiency of bases and high alumina content of the concentrate; the frequent necessity of adding coal to the furnace charge to control the matte grade; and the high grade of matte produced.

2c-3. Production of "Crown Special" Zinc. *Industrial Chemist and Chemical Manufacturer,* v. 23, Dec. 1947, p. 806-816.
The plant of the Imperial Smelting Corp. at Avonmouth, England. Fowsheet for the production of sulphuric acid, crude zinc oxide, cadmium, and zinc from zinc concentrate obtained from Australia.

2c-4. Electric Furnace Smelts Sullivan Tin Concentrate. John B. Huttl. *Engineering and Mining Journal,* v. 149, Jan. 1948, p. 60-62.
Procedures and equipment used by Consolidated Mining and Smelting Co. of Canada, Ltd.; flowsheets.

2c-5. The Inorganic Chemistry of Some Metallurgical Processes. A. J. E. Welch. *Annual Reports on the Progress of Chemistry,* v. 43, 1947, p. 129-137.
Recent developments in production of metals by chemical and electrochemical processes: extraction of magnesium (particularly from sea water); production of highly electropositive metals by thermal reduction processes; extraction of alumina and aluminum from clay; and the extraction chemistry of beryllium and zirconium.

2c-6. Smältanrikning av Mangan Fran Spegeljarn i Sulfid-Oxidslagg Genom Inblasning av Slaggbildarna. (Concentration of Manganese From Liquid Spiegeleisen in a Sulphide-Oxide Slag by Blowing the Slag Formers.) Helge Lofquist. *Jernkontorets Annaler,* v. 131, no. 11, 1947, p. 493-517.
Manganese-rich equilibrium slags were produced more rapidly and effectively by blowing the slag-forming substances containing S and O_2 from the bottom into the molten alloys in order to increase the reaction interface. It was found most convenient to blow in pyrite concentrate with a controlled amount of air, whereby the remaining nitrogen protected the slag layer against oxidation. This method gave, with high yields of Mn and S, slags containing 60 to 65% Mn, 3 to 5% Fe, 3% SiO_2 and 16 to 18% S. A heat balance indicates that such a process could be carried out in a converter by means of its own heat of reaction. 13 ref.

For additional annotations indexed in other sections, see: 27c-1.

2d — Light Metals

2d-1. Aluminum Refining. *Metal Industry,* v. 71, Nov. 28, 1947, p. 447-449; Dec. 5, 1947, p. 467-469. Based on recent F.I.A.T. report.
A review of recent German developments. Four methods are utilized: dissolution, oxidation, volatilization, and electrolysis.

For additional annotations indexed in other sections, see: 27d-2.

3 PROPERTIES

3a — General

3a-1. Alloys for Severe High-Temperature Service. W. C. Leslie and D. J. McPherson. *Engineering Experiment Station News* (Ohio State University), v. 19, Dec. 1947, p. 42-47.
Past developments. Work at Ohio State on Timken 16-25-6 alloy (Cr-Ni-Mo steel) and on Cr-Ti binary alloys.

3a-2. Permanent Magnet Alloys. Earl M. Underhill. *Electronics,* v. 21, Jan. 1948, p. 122-123.
Nominal magnetic, physical, and mechanical characteristics of 42 types of magnet steels, cast magnets, magnetic alloys, and sintered magnets are tabulated.

3a-3. A Connection Between the Criterion of Yield and the Strain Ratio Relationship in Plastic Solids. Geoffrey Taylor. *Proceedings of the Royal Society (Series A),* v. 191, Dec. 3, 1947, p. 441-446.
The assumption that the work involved in small plastic strains reaches a maximum when the yield-stress criterion is varied leads to a relationship between the yield-stress and the strain-ratio relationship. It is usually assumed that the stress-strain relationship is one of simple proportionality. Experiments, however, show that this assumption is not true for metals. The observed relationship is used in conjunction with the assumption of maximum work during a given strain to calculate the criterion of yield. It is found that this is very close to, but not identical with, the Mises-Hencky criterion.

3a-4. Jet Engine Progress Keyed to Fabrication; Metallurgy. *SAE Journal,* v. 56, Jan. 1948, p. 66-67. Based on "The Metallurgical Aspects of Turbine Wheels and Nozzles", by E. M. Phillips.
Preprint previously abstracted. See 3-356, R. M. L., v. 4, 1947 (*Metals Review,* Dec. 1947).

3a-5. Beschouwingen bij de Vervormingloze en Brosse Breuken. (The Phenomenon of Brittle Fracture Without Deformation.) W. Soete. *Metalen,* v. 2, Nov. 1947, p. 41-45; Dec. 1947, p. 65-75.
The shear-strain-energy theory and the maximum-normal-stress law are considered as plausible criteria for deformation and fracture. The influence of nonuniformity of stressing and strain hardening on flow and fracture strength are investigated. A survey of factors influencing the resistance of the metals is given. 17 ref.

For additional annotations indexed in other sections, see: 6a-4, 11-1.

3b — Ferrous

3b-1. Measurement of Young's Modulus at High Temperatures. M. H. Roberts and J. Northcliffe. *Journal of the Iron and Steel Institute,* v. 157, Nov. 1947, p. 345-348.
Measurements were made for various steels from room temperature up to 1000° C. by causing a cylindrical rod of the steel to vibrate transversely with its fundamental frequency. From the frequency and the mass and dimensions of the bar, Young's modulus was calculated. Results show a decrease with increase in temperature.

3b-2. A Comparison of Molds of Standard Composition and of Approximately Ingot Mould Subcommittee Composition. W. L. Kerlie. *Journal of the Iron and Steel Institute,* v. 157, Nov. 1947, p. 410-415.
A number of ingot molds of two different compositions were examined under carefully controlled conditions. Direct correlations between silicon content and mold life and phosphorus content and mold life were found. For the composition recommended by the Ingot Mould Subcommittee an average mold life of 130 casts can be expected, compared with an average of 100 for the standard composition.

3b-3. Alloys for High Creep Strength. *Product Engineering,* v. 19, Jan. 1948, p. 132-134. Condensed from "High-Creep-Strength Austenitic Gas Turbine Forgings", by D. A. Oliver and G. T. Harris, *Transactions of the Institute of Marine Engineers,* v. 59, no. 5, 1947.
Compositions and mechanical properties of three austenitic gas-turbine steels developed by William Jessop & Sons, Ltd., Sheffield, England. Special methods used in production and testing.

3b-4. Toughness of Forgings. *Product Engineering,* v. 19, Jan. 1948, p. 136-137. Condensed from "Toughness and Strength Beyond Requirements for Normal Service", *Drop Forging Topics,* v. 11, no. 4, 1947.
Stress-strain properties of various materials and test methods used.

3b-5. Brittle Fracture in Mild-Steel Plates. Part I. *Engineering,* v. 164, Dec. 5, 1947, p. 532-534; Dec. 12, 1947, p. 536-537; Dec. 19, 1947, p. 581-583; Dec. 26, 1947, p. 605-606.
Part I (in four installments as indicated above) consists of a condensed presentation of three of the nine papers presented at the Conference on Brittle Fracture in Mild-Steel Plates (used in welded-ship construction), Oct. 1945, Cambridge, England. Much of this work has not previously been published. The first installment (Dec. 5 issue) covers 'The Problem of

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22-446, July 1947; 22-500, Aug. 1947; 22-772, Jan. 1948).

There is need for much more fundamental data on the application of this process so that industry can make greater uses of its advantages.

Flash welding is used extensively for joining steel parts. Some unusual joints, such as a T-joint between a tubular section and a flat plate of draft gears on freight cars, are currently being flash welded (22-751, Jan. 1948). This process is also applicable to a limited extent for joining aluminum alloy components. Development of techniques is still in its infancy and recommendations for general use have not been made. Three-stage heat control is used during the welding cycle, and a much greater upset travel distance than in flash welding other materials. Satisfactory welds have been made in 14S, 24S, 52S, 53S, 61S, and 75S aluminum alloys. Welds in the hard temper of these alloys have higher strength than in the annealed alloys.

So far, flash welding of aluminum alloys has been confined to parts in which structural strength is not of primary importance (22-120, Feb. 1947; 22-720, Jan. 1948).

Inspection and Testing

The application of resistance welding, and in particular spot welding, has been governed to a large extent by methods of inspecting and testing welds. New techniques and methods of determining spot weld strength and quality from radiographic images have been developed for nondestructive inspection of welds in aluminum alloys, magnesium alloys, and ferrous sheet materials. This method of inspection is feasible throughout the range of sheet thicknesses commonly spot welded in the aircraft industry (0.016 to 0.188 in. thick). A limited investigation has indicated that radiography provides a sensitive method of evaluating weld properties which influence spot weld fatigue strength and static strength (12-20, Jan. 1947; 12-48, Feb. 1947; 12-62, March 1947; 22-220, April 1947).

Shear tests and impact tests were developed to evaluate spot welds in steel plate (22-648, Oct. 1947).

Some tests of single spot welds and small spot welded specimens in fatigue, static tension, and impact have been reported as showing a gloomy picture for spot welding. Similar tests several years ago, it is pointed out, also revealed the same picture for riveting, but riveted structures have been proved satisfactory by long service. It is suggested that full-sized spot welded structures be given simple bending and torsion tests and then service tests in the same manner that riveted structures were eventually proved satisfactory. This approach to the testing problem, it is opined, will do more toward the development of spot welding than any other means (22-475, Aug. 1947).

The Reviewing Stand

GOOD NEWS!

It is with deepest satisfaction and pleasure that we call attention to the announcement on page 2. Now, at long last, you can clip and save your Review of Metal Literature and other useful monthly features without the fear that they will disintegrate into brittle yellow scraps before you ever have a chance to refer to them.

So it is with pride that we offer you a magazine of which you too can be proud—proud that the quality of its paper and printing will match at last the quality of its content. (For unbiased opinion as to that, see adjacent columns!)

EVERY once in a while something comes across the editorial desk that makes the daily struggle with small details seem worth the effort. This month it is a book review in the January 1948 issue of *Special Libraries* written by Emory C. Skarshaug, research librarian of Federal-Mogul Corp. Perhaps we may be pardoned for quoting a few excerpts:

"Since the review of volume one of 'The A.S.M. Review of Metal Literature' was published in *Special Libraries* in November 1946, two additional volumes have appeared. The three volumes of this title to date constitute a significant addition to the reference literature of metallurgy in the broadest sense of the term. Like volume one, the material in volumes two and three is compiled in the library at Battelle Memorial Institute, and is first published in the monthly issues of *Metals Review*, thus making this combined service, to our knowledge, the most timely and prompt publication in the world in its field . . . . .

"A word about the revised *Metals Review*, from which the annual volumes are cumulated. As the consequence of a survey by questionnaire, this journal, now in its 20th volume, suddenly changed. (Its abstracting service began with the February issue of 1944.) In January 1947 the journal changed from a folio size to quarto or letter-size format (8½ x 11 in.) suitably convenient for handling and binding; and beginning with the January issue, each number has a feature section devoted entirely to a single topic. This feature section consists mainly of comprehensive review articles based on the extensive abstracting services of the Review of Current Literature, and cites references simply by the numbers assigned them in *Metals Review* or in the bound volumes; in other words, these comprehensive surveys and their tidy handling of references are possible only on the basis of the extensive coverage and numerical make-up scheme of the Literature Review; they are a thoroughly useful novelty made possible only on the basis of the Literature Review.

"Between the Review of Metal Literature and the *Metals Review*, the A.S.M. turns out the most timely abstracting service in the world, to our knowledge, in the field of metallurgy; also this is the only service of its kind devoted exclusively and entirely to the field of metallurgy and all of its sidelines, both ferrous and nonferrous; finally, through its membership services it reaches a clientele virtually impossible to cover by any other service in the field. We wish to congratulate the editors, the American Society for Metals, and the Battelle library staff on their work to date on *Metals Review* and on the Review of Metal Literature. We anticipate future volumes with favor and hope they will be forthcoming."

Thank you, Mr. Skarshaug! M.R.H.

Brittle Fracture in Ship Structures", by J. F. Baker (17 ref.). The second installment (Dec. 12 and 19) covers "Brittleness in Ship Steel", by J. L. Adam. In the light of 40 years' experience in shipbuilding he speculates on the reasons for recent failures, especially in American ships. Diagrams illustrate the locations and types which have been found in ships constructed with different combinations of welding and riveting. The last two installments (Dec. 19 and 26) cover "Fracture and Notch Brittleness in Ductile Metals", by E. Orowan—an extensive and critical discussion of work done and theories advanced up to the present time. (To be continued.)

3b-6. Causes of Low Ductility in Mild Steel. J. F. Baker. *Engineering*, v. 164, Dec. 5, 1947, p. 548-550.

Condensed version of appendix to the paper, "Problem of Brittle Fracture in Ship Structures" (see 3b-5). Fundamental principles. Charts and diagrams show variations of ductility with temperature and with load. (Presented at Conference on Brittle Fracture in Mild-Steel Plates, Cambridge, Oct. 26, 1945.)

3b-7. Acicular Cast Irons. *Engineering*, v. 164, Dec. 19, 1947, p. 596; Dec. 26, 1947, p. 607-608. Condensed from fourth report of the Research Committee of the Institution of Mechanical Engineers on "High-Duty Cast Irons for General Engineering Purposes: Acicular Cast Irons", by J. G. Pearce.

The effect of heating a pearlitic iron was first determined, then the effects of different alloy additions on the properties of acicular cast iron were studied separately and in various combinations.

3b-8. Sulphuric Resistant Wrought Stainless. *Iron Age*, v. 161, Jan. 15, 1948, p. 83; see also **Sulphuric Resistant Stainless Now Produced in Wrought Forms.** *Steel*, v. 122, Jan. 19, 1948, p. 90, 92.

Properties of new forms of Durimet 20, now available for the first time in bar stock, wire, strip, tubing, and pipe and manufactured by Carpenter Steel Co.

3b-9. The Influence of Radial Pressure From a Press Fit. G. W. C. Hirst. *Engineer*, v. 184, Dec. 26, 1947, p. 598-599. Condensed from "The Influence of Radial Pressure From a Press Fit on the Endurance Limit of Axles and Crank Pins".

Previously abstracted from preprint. (Presented at Symposium on the Failure of Metals by Fatigue, University of Melbourne, Melbourne, Australia, Dec. 1946.) See 3-41, R.M.L., v. 4, 1947 (*Metals Review*, March 1947).

3c — Nonferrous

3c-1. The Efficiency of Thermoelectric Generators. Part I. Maria Telkes. *Journal of Applied Physics*, v. 18, Dec. 1947, p. 1116-1127.

The efficiency of generation of electrical energies by means of available thermocouples is less than 1%. A review of theoretical efficiency calculations shows that higher efficiencies can be attained with materials to which the Wiedemann-Franz-Lorenz relation is applicable, when their thermoelectric power is greater than 200 microvolts per °C. Some Zn-Sb alloys with added metals approach these conditions and produce an experimental efficiency of over 5% in accordance with theoretical calculations. Lead sulphide with excess lead in combination with Zn-Sb alloy produces an efficiency of 7%. 52 ref.

3c-2. Ni-Span C—New, Age Hardenable, Constant-Modulus Alloy. *Inco*, v. 21, no. 4, 1947, p. 22-23.

Properties and application of Ni-Cr-Ti-Fe measuring and timing equipment. Temperature changes between −50 and 250° F. do not expand, weaken, or soften it.

3c-3. Alloys for Nonferrous Forgings. *American Machinist*, v. 92, Jan. 1, 1948, p. 143.

Properties and compositions of eight copper-base alloys and eight aluminum alloys.

For additional annotations indexed in other sections, see: 6b-7, 8-12, 14c-4.

3d — Light Metals

3d-1. When You Buy Aluminum. *Sheet Metal Worker*, v. 38, Dec. 1947, p. 67-68.

Some facts on sheet aluminum, as a guide in purchasing.

3d-2. Incrudimento e Proprieta Elettriche dell' Alluminio. (Cold Working and Electrical Properties of Aluminum.) V. Montoro. *Alluminio*, Sept-Oct. 1947, p. 409-412.

The effects of cold working and tempering on the electrical properties of 99.91% aluminum.

3d-3. Thermal Conductivity of Aluminum. *Engineer*, v. 184, Dec. 26, 1947, p. 600.

Critically reviews recent papers.

3d-4. Ternary Aluminum Alloys. L. Sanderson. *Machinery Lloyd* (Overseas Edition), v. 20, Jan. 3, 1948, p. 110-112.

Properties of a series having an Al-Mg-Zn phase in combination with a range of additional alloys in suitable percentages.

4
CONSTITUTION and STRUCTURE

4a — General

4a-1. Grain Growth. *Metal Industry*, v. 71, Nov. 14, 1947, p. 404; Nov. 28, 1947, p. 442, 449.

The importance of specimen thickness as shown by recent research. The importance of precipitated phases.

4a-2. Internal Stresses Arising From Transformations in Metals and Alloys. F. C. Thompson. *Engineering*, v. 164, Nov. 21, 1947, p. 499. Condensed from paper presented before Symposium on Internal Stresses in Metals and Alloys, London, Oct. 15-16, 1947.

A critical discussion.

4a-3. Recent Advances in X-Ray Analysis. Part I. X-Ray Analysis as a Method of Investigating the Arrangement of Atoms. Part II. Metals and Alloys. Part III. Organic Compounds. Lawrence Bragg. *Paint Technology*, v. 12, Nov. 1947, p. 421-425; discussion, p. 425-426.

Three lectures by Prof. Bragg are presented in condensed form by H. F. Clay.

4b — Ferrous

4b-1. Hydrogen in Steel. J. H. Andrew, H. Lee, H. K. Lloyd, and N. Stephenson. *Iron and Steel*, v. 20, Nov. 20, 1947, p. 580-590; discussion, p. 622-625.

Investigation of the relationship between evolution of hydrogen and transformation characteristics of the steel as well as the occurrence of defects such as cracks, flakes, and "fisheyes". Effect on mechanical properties.

4b-2. Steel Manufacture. C. Sykes, H. H. Burton, and C. C. Gegg. *Iron and Steel*, v. 20, Nov. 20, 1947, p. 591-598; discussion, p. 622-625.

Investigation of the relationships between hydrogen in steel and hairline crack formation. The hydrogen contents of steels at different stages of manufacture, i.e., liquid steel, ingots, billets, forgings, etc., were determined and the results discussed in terms of various theories. Includes a discussion of diffusivity based on theory and experiment.

4b-3. Elastic Relaxation and Some Other Properties of the Solid Solutions of Carbon and Nitrogen in Iron. L. J. Dijkstra. *Philips Research Reports*, v. 2, Oct. 1947, p. 357-381, 399-400.

The theory of elastic relaxation in alpha iron caused by carbon and nitrogen in solid solution predicts a strong anisotropy for the various crystal directions. This conclusion was confirmed by a series of experiments on single crystals of iron. The theoretical absolute magnitude of the effect for carbon. The most probable place of the dissolved particles in the iron lattice. The rate of segregation taking place at 20° C. in the form of carbides or nitrides was determined by measuring the decrease in magnitude of elastic relaxation with time. 19 ref.

4b-4. Effects of Alloying Elements on the Microstructure and Properties of Steel. John M. Hodge. *Steel Processing*, v. 33, Dec. 1947, p. 746-750.

Effects of 17 alloying elements are described and illustrated by charts, tables, and photomicrographs.

For additional annotations indexed in other sections, see: 11-8-9, 18b-2.

4c — Nonferrous

4c-1. Hardening of Metals by Internal Oxidation. Part II. J. L. Meijering and M. J. Druyvesteyn. *Philips Research Reports*, v. 2, Aug. 1947, p. 260-280.

Certain alloys of Ag, Cu, and Ni with a few atomic % of a homogeneously dissolved metal having a sufficient affinity for oxygen can be dispersion hardened by diffusing O_2 into them. Diffusion coefficients of oxygen in internally oxidized Ag and Cu alloys are given. X-ray and electrical resistivity measurements indicate that the MgO and Al_2O_3 particles that harden silver are very small. Mechanical properties are not much affected by long annealings at high temperatures. Creep and recrystallization are slowed down considerably. 20 ref.

4c-2. Superlattice Formation. E. A. Owen and G. MacArthur Sim. *Philosophical Magazine*, 7th Series, v. 38, May 1947, p. 342-354.

Occurrence in $AuCu_3$. Measurement of the intensity of the superlattice lines in relation to the intensity of the main-lattice lines leads to investigation of the variation of nucleus with period of annealing at a given temperature. Some new facts concerning the growth of the nuclei.

4c-3. The Thermal Expansion of the Gold-Copper Alloy $AuCu_3$. E. A. Owen and Y. H. Liu. *Philosophical Magazine*, 7th Series, v. 38, May 1947, p. 354-360.

Changes that occur in the dimensions of the $AuCu_3$ lattice on heating.

For additional annotations indexed in other sections, see: 19c-3.

4d — Light Metals

4d-1. The Recrystallization Temperature of Beryllium. W. A. Alexander, J. K. Swinton, and L. M. Pidgeon. *Canadian Institute of Mining and Metallurgy, Transactions*, v. 50 (Bound with *Canadian Mining and Metallurgical Bulletin*), Dec. 1947, p. 657-662; discussion, p. 662-664.

An unusual method was used, since per cent elongation in tension is practically zero, so that ordinary squeezing or rolling was not possible. It was found possible to strain the metal without cracking by applying a load

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New Welding Equipment

Manufacturers Announce 127 New Products and Processes in Past Six Months

LAST JULY *Metals Review* surveyed the welding field and found that 150 new machines, accessories, and related welding products had been placed on the market in a year's time. In the short space of six months, we now find 127 additional pieces of new equipment worth mention in these columns. Complete details and more extended descriptions may be secured from the manufacturers by using the Reader Service Coupon on page 19 and specifying the number shown in brackets after the manufacturer's name.

Arc Welders

A movable core that travels less than 1 in. to cover the entire range of stepless amperage control contributes to the compact design of a line of a.c. welders including 200, 300 and 400-amp. industrial models. The novel arrangement of dual primary and secondary coils and the elimination of arc boosters, reactor coils and fans are space-saving features. Patented electrical and magnetic circuits provide instant starting and smooth and stable arc at all amperage settings. (Literature available.) **John A. Kern Co.** [77]

Dial-Lectric control in new welders manufactured by **Harnischfeger Corp.** is simply a rheostat arrangement to replace the cranks and wheels in transformer welders. A three-quarter turn of a single dial covers the entire current selection range. It can be mounted either on the welder or at some remote control point. [78]

Low voltage control for high operating efficiency in the low current range is a feature of a new Flexarc industrial line of a.c. welders, available in five output ratings—200, 300, 400, 500, and a duplex 300-600 amp. unit. **Westinghouse Electric Corp.** [79]

A light-weight engine-driven welder, "the Ranger", can be towed anywhere a jeep can take it. Welding current is adjusted in four major steps over a wide range from 30 amp. at 20 volts to 250 amp. at 30 volts. **Westinghouse Electric Corp.** [80]

Westinghouse has also announced a Weldomatic welder that incorporates welding head, control equipment, welding transformer and work-positioning equipment in one unit. The welding head, suitable for alternating or direct current, operates with a capacity of 1200 amp. a.c. Wire feed is automatic. [81]

A smaller and lighter-weight Hornet 36A motor-generator arc welding machine for heavy work has been announced by **Wilson Welder and Metals Co.** It is available in 200, 300 and 400-amp. models. [82]

Hobart Brothers Co. has issued a 36-page, three-color catalog containing illustrations, descriptions, dimensions and specifications on its complete line of "simplified" arc welders. [83]

Aluminum housing and engine parts are responsible for the light weight (315 lb.) of a portable, gas-driven d.c. arc welder rated at 150 amp. at 30 volts on 50% duty cycle. **Hollup Corp. division of National Cylinder Gas Co.** [84]

To those who wish to build their own d.c. welder **Harnischfeger** is offering a 300-amp. bare welding generator with a service range of 30 to 375 amp. (Literature available.) [85]

A controller that automatically starts the welder when the operator touches the electrode to the workpiece, and shuts it off a few moments after welding has stopped, can be installed on any standard d.c. motor-generator welder. **D-V Welding Controls.** [86]

Inert-Gas Shielded-Arc Welding

An electronically controlled automatic Heliweld unit, designed for continuous operation, consists of a holder, holder carriage and a control box; outstanding feature is automatic maintenance of constant arc length. [87] A machine-type Heliweld electrode holder is designed for mounting on a radiagraph or other suitable travel mechanism for moving along the joint or for fixed position use with the work moving beneath the arc. [88] A water-cooled manual Heliweld holder is a third piece of new equipment by **Air Reduction Sales Co.** [89] (Literature available.)

Linde Air Products Co.'s new booklet on Heliarc welding devotes 24 pages to telling what the process is and what it will do; how it saves money, material and time; what equipment is required; and where and how to use it. [90]

A new shutoff valve, designed to cut down argon consumption, has been developed by **Linde Air Products Co.** The valve controls both argon and water supply, and is operated by an extension lever on which the torch is hung when not in use; the valve is opened or closed merely by hanging or removing the torch from the hook. [91]

A 220-440-volt a.c. welding transformer has been designed by **General Electric Co.** specifically for use with the Inert-Arc welding process. Transformer, control panel, capacitors for power factor correction, a bank of series capacitors to stabilize the arc, a pilot spark circuit for arc starting, and water and gas solenoid valves are built into a single unit. [92]

A new a.c. welder especially designed for use with Linde's Heliarc equipment embodies high-frequency stabilization to insure easy starting and dependable maintenance of the gas-shielded arc with practically no rectification of the a.c. current passing through it. **Hobart Brothers Co.** [93]

Glenn-Roberts Co. is applying for patents on a novel "correct arc" circuit incorporated in a dual-purpose welder for either inert-gas or metallic-arc work. In addition to a high-frequency circuit to start and maintain the arc without touching the workpiece to the electrode, a filter-choke circuit substantially reduces the rectification effect of the inert-gas arc. This feature reduces overheating, excessive input, lowered output and low power factor. [94]

Submerged Melt Welding

A new flexible welder for the Unionmelt process is semi-automatic in that the welding nozzle is at the end of a 20-ft. flexible hose. The hose contains the welding current cable and two tubes through which the welding rod and the granular material are fed. The nozzle can be moved from one weld to another without stopping to set up track, carriage, or other guiding equipment. (Literature available.) **Linde Air Products Co.** [95]

An automatic welder with a submerged-melt head has an electronic control that varies the speed of the head along a track so that the length of welding is governed only by the track length. For welds perpendicular to the track, the head can travel at a variable speed along a cantilever beam. **Niagara Machine and Tool Works.** [96]

Resistance Welders—Spot

A new principle in stored-energy spot welders devised by **Progressive Welder Co.** depends on building up kinetic energy in a heavy flywheel operated by a simple motor-generator set. When the heavy load is applied during the making of a spot weld, the generator is kept turning by the energy of

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of 150 kg. to a ½-in. cube with a ¼-in. steel ball. Samples were annealed at different temperatures in a hydrogen atmosphere then examined for change in structure, to find the lowest temperature at which recrystallization would appear. This was found to be about 810° C.

5
POWDER METALLURGY

5a — General

5a-1. Sintered Semiconductors. Henry H. Hausner. *Electronics*, v. 21, Jan. 1948, p. 138, 178, 180, 182, 184.

Production and fundamental principles of ceramic-metal compositions. Results of investigations of the effects of particle size and distribution, and of sintering temperature.

5a-2. Where Does Powder Metallurgy Stand Today? H. R. Clauser. *Scientific American*, v. 178, Jan. 1948, p. 12-15.

Reviews present status.

5a-3. Uses for Metal Powders. H. W. Greenwood. *Machinery Lloyd* (Overseas Edition), v. 19, Dec. 20, 1947, p. 81-82.

A brief survey.

5a-4. Powder Metallurgy; Its Potential Value to the Engineering Industry. H. W. Greenwood. *Metal Industry*, v. 71, Dec. 26, 1947, p. 519-520.

The value of powder metallurgy as a means of solving problems in the production of better wear resistant materials and of metals and alloys capable of withstanding high temperatures under load. Other applications.

For additional annotations indexed in other sections, see: 16a-1, 27a-4-7.

5c — Nonferrous

5c-1. German Production and Use of Boron Carbide and Titanium Boride. *Industrial Diamond Review*, v. 7, Nov. 1947, p. 343-344. Based on B.I.O.S. Final Report No. 925, Items 21 and 22.

5c-2. Sintered Carbides. Part I. Production and Properties. E. M. Trent. *Metal Industry*, v. 71, Dec. 19, 1947, p. 499-502.

Previously abstracted from *Engineer*, v. 184, Oct. 24, 1947, p. 396-397. See 5-74, R.M.L., v. 4, 1947 (*Metals Review*, Dec. 1947).

5c-3. Sintered Carbides. Part II. Specialized Applications in the Metal-Working Industries. H. Eckersley. *Metal Industry*, v. 71, Dec. 26, 1947, p. 521-523.

See 5-76, R.M.L., v. 4, 1947 (*Metals Review*, Jan. 1947).

6
CORROSION

6a — General

6a-1. Erosion-Corrosion. Walter A. Luce. *Engineering Experiment Station News* (Ohio State University), v. 19, Dec. 1947, p. 29-32.

A form of attack which often causes unexpected and rapid deterioration of plant process equipment. Test equipment used at Ohio State for study of such problems.

6a-2. Ocean Put in Test Tube at Kure Beach. *Inco*, v. 21, no. 4, 1947, p. 4-9.

Test facilities and procedures.

6a-3. Corrosion of Filters in Sugar Refineries. Part III. Investigations on Hot Liquors. H. Inglesent and J. Anderson Storrow. *Industrial Chemist and Chemical Manufacturer*, v. 23, Dec. 1947, p. 827-834.

Tests were made on sugar liquors at plant operating temperatures to verify certain conclusions drawn from investigations of differences between electrode potentials of common constructional metals at room temperatures. In general, the metal pairs showed the same polarity at high and low temperatures where the differences were large.

6a-4. Selecting Alloys to Resist Cavitation Erosion. R. Beeching. *Product Engineering*, v. 19, Jan. 1948, p. 110-113.

Comparative data on the strength and erosion resistance of many alloys in fresh and sea water; factors to be considered in making a choice of alloy; jet impact, Venturi, and vibratory erosion testing techniques. The validity of various test results is evaluated.

6a-5. Corrosion and Methods of Protection. W. Wiederholt. *British Chemical Digest*, v. 2, Dec. 1947, p. 92-93. Translated and condensed from *Die Technik*, v. 2, March 1947.

A review.

6a-6. Chimney Liner Corrosion Resulting From Gas-Fired Furnaces. George B. Johnson. *Corrosion*, v. 4, Jan. 1948, p. 15-23.

Results of a continuing study of corrosion of actual installations in Minneapolis and of the effectiveness of different materials and coatings in resisting corrosion. (Presented at Annual Meeting of N.A.C.E., Chicago, April 5-8, 1947.)

6a-7. Recent Developments in the Use of Corrosion Inhibitors. Jay T. Nicholson. *Corrosion*, v. 4, Jan. 1948, p. 32-36.

Presented at N.A.C.E. Western Regional Division Meeting, Los Angeles, June 4, 1947.

6a-8. Corrosion of Metals With Oxygen Depolarization. *Light Metals*, v. 10, Dec. 1947, p. 637-638, 639-645.

Condensation (with some commentary) of Russian book by N. D. Tomashoff, published by Academy of Sciences, Institute of Physical Chemistry, U.S.S.R., Moscow and Leningrad, 1947. Fundamental problems of modern theory of the electrochemical corrosion of metals: local elements and corrosion; electrochemical heterogeneity of the corroding surface; thermodynamics and velocity of corrosion; protective surface films; factors determining the rate of corrosion process. (To be continued.)

For additional annotations indexed in other sections, see: 27a-8.

6b — Ferrous

6b-1. Discussion on the Protection of Iron and Steel Against Corrosion. *Journal of the Iron and Steel Institute*, v. 157, Nov. 1947, p. 349-368.

The Effects of Different Methods of Pretreating Iron and Steel Before Painting, by F. Fancutt (Iron and Steel Institute Special Report No. 31), and The Protection of Iron and Steel by Metallic Coatings, by J. C. Hudson and T. A. Banfield (no. 2 issue, 1946).

6b-2. Stress-Corrosion Cracking of Steels. W. P. Rees. *Engineering*, v. 164, Nov. 21, 1947, p. 489-490. Condensed from "Note on Stress-Corrosion Cracking of Steels in the Presence of Sulphur Compounds", presented at Symposium on Internal Stresses in Metals and Alloys, London, Oct. 15-16, 1947.

Several cases of stress-corrosion cracking upon exposure to media containing sulphur compounds: first, in stainless steel filter wire used in a crude petroleum pipeline; second, in flapper-valve plates of an air compressor; third, on alloy steel cylinders for gas storage.

6b-3. Passivation of Stainless Steel. F. H. Beck. *Engineering Experiment Station News* (Ohio State University), v. 19, Dec. 1947, p. 32-38.

Results of experimental work indicate that the passive film is a layer of physically adsorbed gas on the metal surface or possibly a physically adsorbed gas layer on a hydrous oxide film formed by the passivating methods. Method used for passivating stainless steel and for corrosion testing; the vacuum-breakdown apparatus. Use of synthetic sea water, repassivation by inert gases, and electron diffraction work.

6b-4. High-Temperature Oxidation. H. M. McCullough. *Engineering Experiment Station News* (Ohio State University), v. 19, Dec. 1947, p. 38-41.

Procedures and equipment. Results for two types of stainless steel.

6b-5. Utilization of Electrically Insulated Couplings in Corrosion Control. W. F. Levert. *Corrosion*, v. 4, Jan. 1948, p. 24-28.

By this means, it is possible to isolate sections of pipe lines which lie in corrosive soil and apply cathodic protection to them only. Installation of the couplings at intervals along a pipeline breaks up long-line currents, which are very detrimental. (Presented at First Annual Meeting of the South Central Regional Division, N.A.C.E., Houston, Texas, Oct. 26-27, 1947.)

6b-6. Mechanical Design Features of Insulated Couplings. Paul Williams. *Corrosion*, v. 4, Jan. 1948, p. 29-31.

Presented at first Annual Meeting, South Central Regional Division, N.A.C.E., Houston, Texas, Oct. 26-27, 1947.

6b-7. Corrosion. Mars G. Fontana. *Industrial and Engineering Chemistry*, v. 40, Jan. 1948, p. 89A-90A.

A new malleable, austenitic cast iron; recent developments in the Ni-Resist irons including corrosion test data.

7
CLEANING and FINISHING

7a — General

7a-1. American Anticorrosive and Antifouling Paints. *Engineer*, v. 184, Nov. 21 1947, p. 474-476.

Procedures and materials used by U. S. Navy.

7a-2. Metal Finishing—Emphasis Swings to Utilitarian Finishes. Adolph Bregman. *Iron Age*, v. 161, Jan. 1, 1948, p. 184-189.

Recent developments and future prospects in metallic and nonmetallic coatings, applied by electrolytic and nonelectrolytic methods.

7a-3. Metalizing. Rick Mansell. *Western Metals*, v. 5, Dec. 1947, p. 22-24.

Techniques and applications.

7a-4. The Pullman-Standard Finish. Part 2. W. J. Boltze. *Industrial Finishing*, v. 24, Dec. 1947, p. 34-36, 38.

Methods used in painting and decorating modern streamlined passenger cars. (Concluded.)

7a-5. Surface Treatment. *Steel*, v. 122, Jan. 5, 1948, p. 235-236, 238-240.

Brief reports on new developments: Consumption of Protective Coatings at Highest Rate, by C. R. E. Merkle; Growing Use of Enameled Steel Seen for Housing, by E. Hogenson; Emphasis Is on Obtaining Cleaner Base Metal for Plating, by C. B. F. Young; Trend Toward Combined Use of Plating With

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the flywheel, reconverting the mechanical energy in the flywheel back into electrical current of the high intensity required. (Literature available.) [97]

A two-color technical bulletin issued by **Progressive Welder Co.** describes a new line of standard pedestal spot welders. They are available in 30, 50 and 75-kva. sizes and in 18, 24 and 30-in. throat depths. [98]

Progressive also has a 12-page booklet on press-type spot and projection welders; line drawings and phantom views illustrate the theory and application of spot and projection welding, as well as details of machine construction. [99]

A motor-driven press-type spot and projection welder is characterized by a roller antifriction head and antifriction features in the bellows air lock and bearings for cam follow-up and drive box. **Taylor-Winfield Corp.** [100]

Press-type welders with five power ratings between 20 and 75 kva. and four throat depths between 12 and 30 in. are now furnished by **Sciaky Brothers** with the company's balanced "three-phase" control for solving power supply problems. This feature is provided for the first time on these small machines. (Literature available.) [101]

Banner Products Co. has announced two new welders—a 50-kva. foot or air-operated model with eight ranges of heat selection, and a 3-kva. bench type adaptable to many uses. [102]

A foot-operated spot welder of the pivot type is furnished in 12, 18 and 24-in. throat depths with 10-kva. transformer that has a very short secondary circuit for high efficiency. **Agnew Electric Co.** [103]

Spot Welders—Multiple

Specially designed for spot welding both left-hand and right-hand longitudinal reinforcing members to the main side frame member of an automobile, a multi-spot welder uses 76 guns to make 38 spots per side. Component units of the machine are mounted on one main frame, and include one main loading fixture and carriage, two side carriages, two Ultra-Speed units, the 76 hydraulic guns, four transformers, and a hydraulic pumping unit. **Federal Machine and Welder Co.** [104]

Taylor-Winfield's latest multiple-gun welder was designed for welding back panels to outer shells of refrigerator cabinets at the rate of approximately 100 cabinets per hr. with 120 spots to the cabinet. Multiple air-operated contact cylinders select the electrodes that weld in groups. [105]

Fabrication of Quonset huts has been speeded by a giant machine that welds 88 spots to form the large curved joists. The welder is rated at 1000 kva. peak and welds two thicknesses of 11-gage steel. **Sciaky Bros., Inc.** [106]

In the smaller range is a narrow spot welder that can be ganged for multiple welds. Only 4 in. wide, each unit incorporates controlled air-operated electrode pressure, adjustable current setting, electronic timing, water cooling of the transformer and electrodes and automatic pressure initiation of current. **Metron Instrument Co.** [107]

A recent adaptation of **Progressive Welder Co.'s** multi-transformer welder is designed to produce some 300 steel drawers per hr., the operation consisting of joining the front to the body and adding a stop clip to the bottom of the drawer—a total of 12 welds. Each unit has six 14-kva. transformers, each transformer taking care of two welds in series. [108]

Twelve 3-in. nonrotating, air-operated Anker-Holth cylinders are used on a Progressive 100-kva. spot welder in an automobile plant. The cylinders are used to retract the lower mandrels so the part can be removed after assembly. **Anker-Holth Mfg. Co.** [109]

Projection and Flash Welders

Three new projection welders have been originated by **Federal Machine and Welder Co.** in the past six months —a triple head welder for joining mounting brackets to cooling fins on compressor assemblies, a machine for welding retaining strips and other subassemblies to the steel stampings forming the main body assembly of a typewriter, and another model for welding gasoline engine push rod assemblies at the rate of 1200 per hr. [110]

A flash welder for work on flat mild steel stock with a maximum width of 3 in. or on round and flat mild steel with a maximum cross section of 0.17 sq.in. in known as Type F-1. Upset pressure of 2250 lb. is applied to the work when a platen opening of ¼ to 2 in. is used. Type F-2 is rated at 50 and 75 kva., will take stock up to 4 in. wide, has maximum upset force of 4500 lb., and maximum platen opening of 2½ in. (Literature available.) **Federal Machine and Welder Co.** [111]

Progressive Welder Co.'s improved line of motor-operated flash welders is described in a new technical bulletin. Four basic sizes are listed, having ratings at 50% duty cycle of 20, 50, 100 and 150 kva. and upset forces of 2250, 4500, 11,500, and 19,600 lb. The machines are also available operated by storage battery. [112]

Designed for welding wire and other round steel stock up to ½ in. diameter is a 10-kva. flash and butt welder, operated by a solenoid controlled by a foot switch. An air-operated model is also available for high-speed welding. **Larkin Lectro Products Corp.** [113]

Seam Welding

More consistent welding voltage, considerable power savings, and higher current flow into the work for shorter periods characterize a new type of seam welder for the manufacture of composite or clad plates. Two rotary-type transformers are used in contrast to the conventional transformer which is stationary, and a pulsating current to the weld is obtained by a pulsation timer. **Babcock & Wilcox Co.** [114]

The mash seam type of weld is superior to the overlapping type in that it requires no finishing or dressing prior to porcelain enameling. A machine of this type, known as the Federal triple duplex traveling head series seam welder, has been developed by **Federal Machine and Welder Co.** for making refrigerator food compartment liners. [115]

Federal Machine and Welder also has a seam welder especially designed for use in strip mills. This 125-kva. unit of the double roll, traveling head type makes any strip mill continuous by joining strip ends or skelps in long machine runs. [116]

Resistance Welding Controls and Electrodes

Nonsynchronous welder controls are now being manufactured by **Taylor-Winfield Corp.** for foot, air, motor and hydraulically operated spot, projection, butt and seam welders. Three types are being made—a N.E.M.A. Type 1A weld timer and N.E.M.A. Type N2 and N3 combination controls. (Literature available.) [117]

A low-cost sequence control capable of converting ordinary resistance welders to the production of high-strength spot welds in sheet aluminum and most nonferrous metals can be used with any type of air-operated spot welder of sufficient capacity. **Acro Welder Mfg. Co., Inc.** [118]

An electronic welding timer, the No. 52D Timatron, can be used with spot welders up to 10 kva. A hand control adjusts timing from 0.1 to 5 sec., and this timing, set for a certain thickness, remains automatic through the entire production run. **Ripley Co., Inc.** [119]

A 24-page booklet on resistance welding materials, including replaceable tips, water-cooled holders, seam welding wheels, special dies, electrodes and refractory alloys, also contains valuable technical data for users of resistance welding. **Weiger Weed & Co., division of Fansteel Metallurgical Corp.** [120]

A new line of resistance welding off-set electrodes is available in standard nose shapes, bent from standard stocked electrodes. They are water cooled and bent to an offset and length to fit specific requirements. **P. R. Mallory & Co., Inc.** (Literature available.) [121]

A water-cooled, light-duty holder for hard-to-reach spot welds is also a new Mallory product. It incorporates a button-type, replaceable electrode held in place by an Allen head screw. **P. R. Mallory & Co., Inc.** [122]

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Organic Coatings, by Richard O. Loengard; Use of Titanium Opacified White Enamels to Broaden, by W. A. Deringer; Several Finishing Processes Combined in One Sequence, by G. H. Pimbley; Aluminum, Zinc, Phosphate Coated in Single Solution, by V. M. Darsey; Galvanizing Dross Losses Corrected by Kettle Lining, by W. H. Spowers, Jr.; Metal Corrosion Due to Gas Combustion Studied, by Eugene D. Milener; Solventless Vehicles Introduced in Coatings for Various Uses, by C. Stewart Ferguson; New Raw Materials Available for Metal Protective Paints, by George Diehlman; Backlog for Zinc-Coated Products Still Heavy, by Ernest V. Gent; Hot Dip Galvanizing Aided by Mechanical Handling, by Wallace G. Imhoff; Enameling Industry Limited by Raw Material Shortages, by G. H. McIntyre; Cites Recent Developments in Processes for Coating Aluminum, by F. Keller; Rapid Expansion Noted in National Plating Capacity, by Myron B. Diggin; Progress in Finishes Important From Cost Point of View, by Colin G. Fink; Sees Need for Speedier Finish Evaluating Methods, by Wm. E. Shaw.

7a-6. Unusual Masking Expedites Finishing. Herbert Chase. *Organic Finishing,* v. 8, Dec. 1947, p. 24-25, 27-29.

Spraying of restricted areas of chromium-plated die castings is done through masks produced by plating a shell of metal on the die casting and then cutting out the areas of the shell through which the spray must be applied.

7a-7. Health Hazards of Metal Cleaning Compounds. Part II. P. M. Van Arsdell. *Organic Finishing,* v. 8, Dec. 1947, p. 30-33, 36-38, 45.

Toxic properties of benzene, toluene, xylenes, ethyl benzene, and coal-tar solvents. Compositions of various proprietary metal cleaners and data on maximum allowable vapor concentrations for 8 hr. exposure, flammability ratings, flash points, and explosive limits.

7a-8. Enamel Linings for Metal Containers. Frederick W. Bogert. *Organic Finishing,* v. 8, Dec. 1947, p. 39-45.

Classifications of interior coatings; specifications; coating methods; evaluation of coatings; other considerations.

7a-9. Fundamental Aspects of Metal Cleaning. Jay C. Harris. *American Ceramic Society Bulletin,* v. 26, Dec. 15, 1947, p. 389-392.

The forces involved in the attraction between the metal surface and the various contaminants encountered; means for neutralization of these forces; materials and methods with which to accomplish cleaning.

7a-10. Pyrolytic Plating; Carbonyl Deposition of Molybdenum, Tungsten and Chromium. J. L. Lander and L. H. Germer. *Metal Industry,* v. 71, Dec. 5, 1947, p. 459-461; Dec. 12, 1947, p. 487-489.

Previously abstracted from *Metals Technology.* See 7-391, R.M.L., v. 4, 1947 (*Metals Review.* Nov. 1947).

7a-11. The Prevention of Rust. H. Sanders. *Machinery Lloyd* (Overseas Edition), v. 19, Dec. 6, 1947, p. 74-77.

Uses of greases, oils, solvents, plastics, and their advantages and disadvantages for specific situations.

7a-12. The Metalizing Process. Rick Mansell. *Steel Processing,* v. 33, Dec. 1947, p. 742-745, 765.

Development of the process; preliminary surface preparation methods; the process itself.

7a-13. Finish Application Table. Zola Fox. *Product Engineering,* v. 19, Jan. 1948, p. 161.

Intended as a guide in the selection of proper finishes for the most commonly used ferrous and nonferrous metals, as applied in machine design. Includes electroplating and electrofinishing processes.

7a-14. 1947 Progress in Metal Finishing. Walter A. Raymond. *Metal Finishing,* v. 46, Jan. 1948, p. 58-60.

A review. 74 ref.

7a-15. Tin Coatings on Metals. Frederick W. Bogert. *Metal Finishing,* v. 46, Jan. 1948, p. 68-71.

Historical and descriptive.

7a-16. Finishing Small Electric Appliances. Gerald Eldridge Stedman. *Metal Finishing,* v. 46, Jan. 1948, p. 78-80.

Equipment and procedures in production of miscellaneous appliances.

7a-17. Finishing Clinic. Allen G. Gray. *Products Finishing,* v. 12, Jan. 1948, p. 54, 56, 58, 60, 62, 66, 68, 70, 72, 74.

Strippable plastic coating for surface finishes; testing surface preparation; selection and application of primer in finishing aluminum; barrel nickel and chromium plating; chemical treatment for improving corrosion resistance of tin-plated steel.

7a-18. Barrel Finishing of Metal Products. Part 17. H. Leroy Beaver. *Products Finishing,* v. 12, Jan. 1948, p. 76-78, 80, 82, 84.

The development of finishing materials used in barrels. (To be continued.)

7a-19. New Type Tank Expedites Plastic Dipping Operations. *Iron Age,* v. 161, Jan. 15, 1948, p. 72.

New tank manufactured by Lindberg Engineering Co. results in much more even heat distribution within the plastic mass, which is applied by dip coating. The impeller-type agitator, the heating element, and the heat-dispersal unit contribute to reducing melting time from 6 or 8 hr. to less than 2 hr.

7a-20. Wrinkle Finishes—25 Control Points. E. A. Zahn. *Iron Age,* v. 161, Jan. 15, 1948, p. 78-83.

25 specific factors can have a marked effect upon the finish regardless of its type or texture; methods for controlling them.

7a-21. Electrolytic Resistance in Evaluating Protective Merit of Coatings on Metals. R. Charles Bacon, Joseph J. Smith, and Frank M. Rugg. *Industrial and Engineering Chemistry,* v. 40, Jan. 1948, p. 161-167.

By examination of over 300 test systems the electrolytic resistance was found to be reliable for following protective behavior and for predicting coating life, generally, in less than one fifth the time required by the usual exposure tests based on visual observation.

7a-22. Automatic Spray Booth With Two Separate Paint Circulating Systems. *Machinery,* v. 54, Jan. 1948, p. 192-193.

System employed in painting axle assemblies permits immediate shift from one coating to another.

7a-23. Production Costs Halved by Power-Brush Cleaning. *Steel,* v. 122, Jan. 19, 1948, p. 78.

Oil, grease, and dirt removal from automobile and truck clutch plates.

7a-24. Centrifugal-Force Finishing. George Cavanaugh. *Steel,* v. 122, Jan. 19, 1948, p. 95.

Pressure flow coating, followed by high-speed whirling for removal of excess paint, is proving to be an efficient, economical method of production finishing the small, gas-filled bellows used in many industrial control devices.

7a-25. Molybdenum and Tungsten Coatings. *Engineer,* v. 184, Dec. 26, 1947, p. 601.

Critically reviews recent papers on formation of coatings by dissociation of carbonyl compounds of the metals and deposition of the resulting metallic vapor.

7a-26. The Field and Functions of Flame Spraying. H. W. Greenwood. *Machinery Lloyd* (Overseas Edition), v. 20, Jan. 3, 1948, p. 79-81.

Applications.

7a-27. Metal Polishing. E. J. Wright. *Plating,* v. 35, Jan. 1948, p. 35-37, 98.

Various methods for mechanical polishing; steps for increasing productivity. Conditions existing in Australia.

7a-28. Finishing National Cash Registers. M. W. St. John. *Industrial Finishing,* v. 24, Dec. 1947, p. 62-64, 66.

Cleaning of all metal surfaces, bonderizing, rinsing, drying, prime coating, spot puttying, sanding, second priming, graining, top coating, baking top coats, and application of decalcomanias. (To be continued.)

For additional annotations indexed in other sections, see: 16a-5.

7b — Ferrous Base Metals

7b-1. Selecting the Correct Porcelain Enamel Type for Specific Applications. J. E. Hansen. *Western Metals,* v. 5, Dec. 1947, p. 28-30.

Digest of paper presented at Porcelain Enamel Institute Forum, Columbus, Ohio, Sept. 1947.

7b-2. Automobile Paints: Their Application and Characteristics. H. J. Mason. *Journal of the Oil & Colour Chemists' Association,* v. 30, Nov. 1947, p. 467-478; discussion, p. 478-491.

Types of paints and painting processes used in the automobile industry; procedures and methods by which those paints are evaluated.

7b-3. Chrysler Airtemp Products Finished in Wrinkle Enamel. J. D. Loveley. *Industrial Finishing,* v. 24, Dec. 1947, p. 27-28, 32.

Equipment and procedures for finishing jackets for modern air-conditioning units and oil and gas-fired furnaces and boilers.

7b-4. Phosphate Coating of Frozen Food Cabinets. *Organic Finishing,* v. 8, Dec. 1947, p. 20-21, 23.

Procedures and equipment.

7b-5. Flame Cleaning Equipment for Steel Bridges and Buildings. T. M. Pittman, E. L. Anderson, C. M. Angel, R. E. Berggren, F. L. Etchison, C. H. R. Howe, R. M. Leeds, Francis Martin, C. E. Morgan, S. E. Tracy, and E. G. Wall. *American Railway Engineering Association Bulletin,* v. 49, Dec. 1947, p. 164-166.

Recommended procedures.

7b-6. Ceramic Coatings for High-Temperature Protection of Steel. Gilbert C. Close. *Steel Processing,* v. 33, Dec. 1947, p. 751-754.

Results obtained by W. N. Harrison, D. G. Moore, and J. C. Richmond of the National Bureau of Standards, in cooperation with the N.A.C.A. Use of a modified commercial enamel frit.

7b-7. Factors Affecting Orange Peel. John J. Steencken. *Stove Builder,* v. 13, Jan. 1948, p. 62, 64, 66, 68, 70, 72, 74, 76. Reprinted from *Journal of the American Ceramic Society,* v. 30, no. 2.

A defect in porcelain enamels.

7b-8. Hot Dip Galvanizing—What It Is and How It's Done. Rick Mansell. *Canadian Metals & Metallurgical Industries,* v. 10, Dec. 1947, p. 20-21.

7b-9. Use of Enameling on Railway Signal Systems. (In Russian.) V. S. Artamonov. *Stekol'naya i Keramicheskaya Promyshlennost (Glass and Ceramic Industry),* v. 4, Aug. 1947, p. 13-16.

Proposes substitution of enamels for paints because of greater durability. Technical data on enamel compositions, design of the parts to be enameled, methods for application.

7b-10. Fabricating and Finishing Stainless Steel—Part I. Arthur P. Schulze. *Metal Finishing,* v. 46, Jan. 1948, p. 72-77.

The properties of stainless steel and complete cleaning techniques, other than pickling. 14 ref.

7b-11. How to Choose the Correct Type

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Worn electrode points can be dressed in a few seconds without removal from the welder by the new Porter electrode tip dresser. Hard, wear resistant Tan-Tung steel is used for the cutter blade, which floats in the chuck body so that cutting action is uniform on both edges. **C. O. Porter Machinery Co.** [123]

Gas Welding and Cutting

The Gasweld AV-10 lightweight welding torch for light welding, brazing and soldering has a new cutting attachment furnished with three tip sizes for cutting steel up to 1 in. thick. **Wall Chemicals Division, Liquid Carbonic Corp.** [124]

A hand torch for cutting stainless steel using the Airco flux-injection process brings economical manual flame cutting of stainless steels within the scope of all types of mill and shop operations. It is made in two sizes—21 in. and 36 in. long—both with a 90° torch head. **Air Reduction Sales Co.** [125]

A heavy-duty machine cutting torch with separate high-pressure oxygen cutting stream is made in several lengths and with tips designed for relatively low-pressure operations. The heaviest billets or risers can be cut with minimum chilling effect. **Victor Equipment Co.** (Literature available.) [126]

For straight cuts in metal plate a portable welding torch holder does a better job than hand application. It has a screw feed operated by turning a simple geared crank at the end. **J. A. Campbell Co.** (Literature available.) [127]

A lever-operated built-in gas saver is designed for the user who must have both hands free occasionally to position his work; when the torch is laid down it goes out except for a small acetylene pilot flame. A lever hold-down lock may be had for continuous welding. **Wall Chemicals Division, Liquid Carbonic Corp.** (Literature available.) [128]

A quick shutoff valve developed by **Linde Air Products Co.** controls the supply of both oxygen and acetylene to the blowpipe. Working parts are a hook and a pilot light; gas is shut off when the blowpipe is hung on the hook, and operation is resumed when the tip is passed over the pilot light. [129]

Oxy-acetylene two-stage 760 Series regulators include styles for light welding, heavy welding, cutting and heating; two-stage reduction offers constant, nonfluctuating gas delivery, regardless of the decrease in the contents of the gas cylinder. **National Welding Equipment Co.** (Literature available.) [130]

A flux specifically compounded to dissolve the chromium oxides encountered in welding stainless steel and other high-chromium alloys is designated Airco Formula No. 34. **Air Reduction Sales Co.** [131]

Superior Metal Powders Corp. is making iron powder employed in the oxy-acetylene cutting and scarfing of alloy steels. [132]

Electrodes and Weld Rods

A hydrogen-free, mineral-type, extrusion-coated electrode that eliminates underbead cracking is available in diameters from ¼ to ⅛ in. It requires lower arc voltages than the E6010 and E6020 mild steel electrodes and uses slightly higher current values. **Westinghouse Electric Corp.** [133]

Metal & Thermit Co.'s Murex Type 8015Q is a controlled hydrogen electrode for welding low-alloy steels, particularly where low-temperature service is involved. [134]

Page Hi-Tensile "M" shielded-arc electrode has a hydrogen-free lime-base coating which minimizes underbead cracking, and makes it well suited to use on low-alloy and other hard-to-weld steels without the necessity of preheating or stress-relieving after welding. **Page Steel and Wire Division, American Chain & Cable Co., Inc.** [135]

Added to the Page-Allegheny line of stainless electrodes is a new composition (8 to 10% Cr, 1.25 to 1.75% Mo) developed for the petroleum refining industry. Excellent corrosion resistance is accompanied by high strength and creep resistance. **Page Steel and Wire Division.** [136]

Airco No. 312—an all-position mild steel electrode producing welds of low hydrogen content—has been improved in two ways: It can now be used on a.c. and d.c. reverse polarity current rather than only on d.c. reverse, and preheating of the electrode is no longer required to obtain porosity-free deposits. **Air Reduction Sales Co.** or **Wilson Welder and Metals Co.** [137]

Eutectic Welding Alloys Corp. has added to its "low temperature" Eutectrode series No. 67AC and 670DC. These have been developed for joining, filling, filleting and overlaying all types of steel where high tensile and impact strength are required. Their corrosion resistance is particularly good. [138]

Among new electrodes developed by **Hobart Brothers Co.** are No. 111HT, designed for shielded-arc welding of low-alloy high-tensile steels in the down-hand positions [139]; No. 13, a fast electrode for out-of-position welding on light-gage sheet metal and for welding light sections of mild steel to heavier ones [140]; and No. 12, a heavy-coated electrode for d.c. straight polarity or a.c., at higher current ratings to increase welding speed on poor fitup jobs. [141]

A general-purpose electrode, the Agile Red-White, falls into Class E6012, but is coated with a material that will withstand 20 to 35% higher welding amperages than are common; thus welding speed is considerably higher. **American Agile Corp.** [142]

Among the new electrodes and rods specifically designed for welding cast iron are Eureka No. 100 pure nickel welding electrodes made by **Welding Equipment & Supply Co.** (literature available) [143]; **Hobart Brothers Co.'s** Softcast A, a copper-nickel alloy with a mineral flux coating [144]; and EutecRod 14FC made by **Eutectic Welding Alloys Corp.**, a flux-coated torch welding rod with coefficient of expansion the same as that of gray cast iron, and hardness approximately Brinell 190. [145]

For fabricating and repairing silicon bronze parts, **Ampco Metal, Inc.**, has introduced Sil-Trode, a shielded-arc silicon bronze electrode operating on reverse (positive) polarity, direct current. [146]

The complete line of Ampco bronze electrodes is described in a new booklet that contains sections on procedures, weldability, machinability and other bronze welding data. [147]

Bronze welding rods are also described in a six-page folder issued by **Titan Metal Mfg. Co.** Approximate chemical and physical properties of seven types of welding alloys are shown in table form. [148]

Carbon electrodes for a.c. welding are advantageous for work requiring applications of heat by radiation. They are furnished either plain or copper-coated for better carrying capacity and burning qualities when the current is high. **Speer Carbon Co.** [149]

A cutting rod consisting of a metallic core, surrounded by a sheath or coating that becomes extremely exothermic at high temperatures, is known as Cut-Trode. The coating serves to focus and intensify the energy of the electric arc so that relatively thin cuts can be made in heavy steel plates or sections. It can be used with an ordinary welder and is well adapted to underwater cutting. **Eutectic Welding Alloys Corp.** [150]

A 24-page brochure is devoted exclusively to gas welding wire and its uses; it covers application, procedure, proper torch adjustment; and physical properties of each gas welding rod made by **Page Steel and Wire Division.** [151]

A new leaflet on "Metal Powders for Welding Electrode Manufacture" has been issued by **Murex Limited.** [152]

Hard Surfacing

The field of automatic welding has been expanded to including hard facing, with the introduction of wire in coil form for this purpose. The wire is actually a continuous steel tubing which has the required ductility for

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of Porcelain Enamel for Specific Applications. J. E. Hansen. *Products Finishing*, v. 12, Jan. 1948, p. 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52.

Presented at 9th Annual P.E.I. Forum, Columbus, Ohio, Sept. 10-12, 1947.

For additional annotations indexed in other sections, see: 6b-1, 19b-5, 22b-11-13, 27b-1.

7c—Nonferrous Base Metal

7c-1. Tinning Manganese Bronze. I. R. Valentine. *Steel*, v. 122, Jan. 12, 1948, p. 68-70.

Difficulties encountered in the production of sand-cast bearings were overcome by investigating specifications, checking components for zinc equivalence and then recommending production of units according to analyses that more rigidly define zinc-equivalent elements.

7c-2. Report on Sodium Silicate Cleaners. A. B. Middleton. *Die Castings*, v. 6, Jan. 1948, p. 65, 68-69.

Sodium silicates, when used to clean zinc materials prior to copper plating, have often been accused of leaving a film on the work which, it is claimed, causes the subsequent copper plate to be nonadherent. Experimental work by Hazel and Stericker has shown that when the right type of silicate is used under properly controlled conditions, satisfactory results can be obtained. A review of the materials, conditions, and procedures of the experimental work indicates that their conclusion is justified.

7c-3. Synthetic Enamels for Insulation of Copper Wire. C. R. Pye. *Plastics* (London), v. 11, Dec. 1947, p. 625-629.

A review. 29 ref. (To be continued.)

7c-4. La Couche de Phosphatation; son Aspect, son Epaisseur. (The Phosphate Layer; Its Appearance and Its Depth.) E. Jaudon. *Métaux et Corrosion*, v. 22, July 1947, p. 121-124.

A metallographic study of the structure of zinc phosphate and manganese phosphate layers.

7c-5. Cleaning Nonferrous Metals With Sodium Hydride. H. L. Alexander. *Wire and Wire Products*, v. 23, Jan. 1948, p. 35-41, 96-97; discussion, p. 62-63.

Development of the process, recommended procedures, equipment, and applications. (Presented at Wire Association Annual Convention, Chicago, Oct. 1947.)

7c-6. Speed Production of Protective Wire Coating Through Immersion Melting System. Charles W. Ange. *Wire and Wire Products*, v. 23, Jan. 1948, p. 47, 81-82.

Kemp immersion-fired melting-pots have greatly accelerated production of Okoloy protective coating for insulated copper conductors. Equipment and procedures.

7d—Light Base Metals

7d-1. Surface Treating Aluminum for Corrosion Resistance and Finish Adhesion. *Modern Metals*, v. 3, Dec. 1947, p. 16-18.

Alodine chemical process for inactivating the surface of aluminum products in preparation for finishing them; its applications by Minneapolis-Honeywell in manufacture of controls.

7d-2. Latest Methods for Cleaning Aluminum Prior to Painting. S. H. Phillips. *Automotive Industries*, v. 98, Jan. 15, 1948, p. 42-43, 45, 54.

Methods and equipment used by Douglas Aircraft Co.

7d-3. La Peinture de l'Aluminium. (Painting of Aluminum.) Part II. (Concluded.) J. J. Meynis de Paulin. *Revue de l'Aluminium*, v. 24, Nov. 1947, p. 325-331.

Properties and compositions of primers and methods of adding pigments. Variations in the final step, according to whether the aluminum object is to be used indoors or out.

7d-4. Some Swedish Opinions on Paints and Paint Constituents. *Paint Manufacture*, v. 17, Dec. 1947, p. 426-427.

Six abstracts from *Farg och Fernissa* (Paint and Varnish) on: turpentine and white spirit; boat paints; influence of paints on safety and efficiency; chemical resistant varnishes; paint as protection for light alloys; and black iron oxide as a pigment.

For additional annotations indexed in other sections, see: 23d-6.

8 ELECTRODEPOSITION and ELECTROFINISHING

8-1. Anodes—VII; Rolled, Forged, and Sintered Nickel Alloys. E. R. Thews. *Metal Industry*, v. 71, Nov. 7, 1947, p. 388-389; Nov. 21, 1947, p. 427-429.

8-2. Plating to Specification. E. A. Ollard. *Metal Industry*, v. 71, Dec. 5, 1947, p. 462-464.

Recommended procedure for nickel deposition. (To be concluded.)

8-3. Plating to Specification. E. A. Ollard. *Metal Industry*, v. 71, Dec. 19, 1947, p. 503-504.

Recommended procedure for nickel deposition. (Concluded.)

8-4. Thickness Standards for Nickel Electroplate. George Black. *Product Engineering*, v. 19, Jan. 1948, p. 163.

Tabulates A.S.T.M., aircraft, automotive, and British standards.

8-5. On the Amorphous and Crystalline Oxide Layer of Aluminum. A. J. Dekker and W. Ch. Van Geel. *Philips Research Reports*, v. 2, Aug. 1947, p. 313-319.

Oxidation of anodized aluminum results in formation of a crystalline layer. Experiments show that this layer only fills up the holes of the amorphous Al_2O_3. Also, there is a correlation between the current density in oxalic acid and the porosity of the amorphous layer thus formed.

8-6. The Cyanide Content. J. B. Mohler and H. J. Sedusky. *Metal Finishing*, v. 46, Jan. 1948, p. 61-62, 67.

How to make up various cyanide baths from data given in formulas. Meanings of the common terms in cyanide plating.

8-7. Fluid Mechanics: Forgotten Factor in Electroplating. Part II. Joseph B. Kushner. *Metal Finishing*, v. 46, Jan. 1948, p. 63-67.

Discusses: surface tension; adhesion, cohesion, and wetting; surface tension in metal cleaning; surface tension and dragout; surface tension and pitting and nodules; surface tension and bright plating.

8-8. Rapid Small Parts Handling Features Buick Plating Setup. Herbert Chase. *Products Finishing*, v. 12, Jan. 1948, p. 16-18, 20, 22, 24, 26.

Bright zinc is applied to chassis parts both in automatic-barrel and racked-part lines. Cadmium plating and phosphating are done efficiently.

8-9. Aufgaben und Probleme der Neuzeitlichen Elektrochemie. I. Die Kathodische Abscheidung der Metalle aus wässrigen Lösungen und ihre Praktische Anwendung in der Galvanotechnik. (Assignments and Problems of Modern Electrochemistry. Part I. Cathodic Deposition of Metals From Aqueous Solutions and Its Practical Application to Electrotechnique.) Fr. Müller. *Chimia*, v. 1, Nov. 15, 1947, p. 213-223.

Progress in recent years; problems still to be solved. 194 ref.

8-10. Notes on Nickel and Chromium Plating. C. F. Nixon and R. C. Olsen. *Plating*, v. 35, Jan. 1948, p. 27-33, 95.

Depositing chromium over bright nickel plate in the same plating machine or, if a plating machine is not involved, without reracking through a sequence of still tanks. Cost-cutting advantages; technical difficulties.

8-11. Electroforming—a Literature Review and a New Application. W. H. Safranek, F. B. Dahle, and Charles L. Faust. *Plating*, v. 35, Jan. 1948, p. 39-49.

The status of electroforming; significant advantages; practical methods and procedures. A new process for the continuous automatic production of fountain-pen caps indicates possibilities for low-cost mass production of other consumer's goods. Results of a pilot-plant development. Classified bibliography contains patent references plus 65 journal references.

8-12. Physical Properties of Electrodeposited Metals. Part I. Nickel. Section 1. Literature Survey. A. Brenner and C. W. Jennings. *Plating*, v. 35, Jan. 1948, p. 52-58.

Results of A.E.S. Research Project No. 9. Bibliography arranged by year of publication, including a subject index. 152 ref.

For additional annotations indexed in other sections, see: 7a-2-5-6-13-14-15-17, 11-5.

9 PHYSICAL & MECHANICAL TESTING

9a — General

9a-1. The Significance of Mechanical Testing. H. E. Davies and J. McKeown. *Metallurgia*, v. 37, Nov. 1947, p. 19-22.

9a-2. Mechanical Testing of Materials by the Torsion Method. Ya. B. Fridman. *Metallurgia*, v. 37, Nov. 1947, p. 53-54. Based on paper in *Zavodskaia Laboratoriya*, v. 11, no. 9, 1945, p. 852.

Compares the four basic methods of loading and points out disadvantages of methods other than torsion for cases in which it is important to determine mechanical properties under conditions of considerable deformation. When, however, it is necessary to reveal resistance to rupture, tension or bend testing is recommended.

9a-3. Laboratory for Mechanical Testing at Very Low Temperatures. John L. Zambrow. *Engineering Experiment Station News* (Ohio State University), v. 19, Dec. 1947, p. 4-9.

Facilities at Ohio State.

9a-4. A Recording Dilatometer for Metallurgical Research. J. O. Lord. *Engineering Experiment Station News* (Ohio State University), v. 19, Dec. 1947, p. 9-11.

Piece of apparatus for studying dimensional changes from about −300 to 2400° F. at Ohio State.

9a-5. Fatigue Testing Production Parts. C. B. Griffin. *Iron Age*, v. 161, Jan. 8, 1948, p. 59-62.

A machine developed by General Motors for fatigue testing full-size parts and assemblies; method of operation.

9a-6. Determination of the Yield Point on the Basis of the "Magnetic Diagram of Elongation". (In Russian.) M. V. Dekxtiar, L. M. Baldina, and V. A. Kirichkova. *Zavodskaya Laboratoriya (Factory Laboratory)*, v. 13, Sept. 1947, p. 1056-1063.

Since elongation diagrams for non-standard specimens cannot usually be produced on tensile test machines, a new method was developed based on the variation of magnetic permeability

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coiling and unreeling. Various alloying elements to produce the desired type of hard facing are contained within the tubing. Many of the wires are similar to Stoody manual electrodes. **Stoody Co.** [153]

For manufacture of composite metal-working tools by using a carbon steel base and building up edges of tool-steel quality, a new electrode, Toolweld A & O, is designed to simplify procedures and reduce cost. The deposited metal is of the 5% chromium type and may be used either as welded or subjected to a wide range of heat treatments. The symbol "A" stands for air quench; "O" for oil quench. **Lincoln Electric Co.** [154]

Amsco Toolface, a high-carbon, high-chromium, high-molybdenum composition containing tungsten and vanadium, is described in a new bulletin. Technical data on welding procedures and heat treating are included. **American Manganese Steel Division.** [155]

Redhard Metals, Inc., has a new hard facing rod of chromium-cobalt-tungsten composition. [156]

Coast Metals No. 15 is a high-carbon, chromium-nickel-molybdenum-cobalt composition, supplied in the form of cast welding rods, either bare for oxy-acetylene welding or coated for electric arc application. It is notable for its resistance to both abrasion and impact, and high-temperature properties and resistance to corrosion are above average. **Coast Metals, Inc.** [157]

For resistance to impact, wear and abrasion, **General Electric Co.** has Type W-94. It will workharden to better than Rockwell C-50, and operates on a.c. or d.c. reverse polarity. [158]

For the railroad field **Air Reduction Sales Co.** has announced a new wear resistant bronze welding rod, particularly suitable for building up worn piston heads, valve bull rings, driving box laterals, shoes, wedges, and similar wearing parts. [159]

Amsco Railface electrodes have been developed specifically for use on high-carbon rail. A composite, coated electrode (carbon-chromium-molybdenum) for a.c. or d.c. current, it gives magnetic deposits of pearlitic steel. **American Manganese Steel Division.** [160]

Nickel-manganese steel plates are also supplied by **American Manganese Steel Division** for repair or build-up of large wearing areas. They are furnished in ¼ to 1-in. thickness and 4x12 ft. or cut to order. They can be torch-cut to desired shape and welded on with Amsco nickel-manganese steel electrodes. [161]

The complete line of Amsco welding products for reclamation and hard surfacing of wearing parts is explained in a 28-page illustrated bulletin. **American Manganese Steel Division.** [162]

Timang manganese-nickel steel welding rod is of such composition that it dilutes the carbon of the manganese steel being welded (thus liberating less carbide) and diffuses a certain amount of nickel into the steel (further reducing carbide separation and promoting toughness). **Taylor-Wharton Iron and Steel Co.** [163]

Cast manganese steel in various forms and shapes is also available from **Taylor-Wharton Iron and Steel Co.** for the repair of manganese steel castings, railway frogs and switches, power shovel parts and crusher parts. (Literature available.) [164]

Manganese-nickel electrodes have been introduced by **Page Steel and Wire Division** in three grades: Mn-Ni bare electrodes, for track work and other railroad applications where appearance of the weld is not important; Mn-Ni shielded-arc electrodes, which are coated by the extrusion process to insure uniformity; and special Mn-Ni shielded-arc electrodes, of such an analysis that peening while hot is unnecessary before depositing another weld bead. [165]

For producing hard overlays on copper at temperatures well below its melting point **Eutectic Welding Alloys Corp.** has developed two special flux-coated rods identified as EutecRods 183FC and 184FC, as well as special EutecTrode 30AC and 300DC for arc welding both electrolytic and deoxidized copper. (Literature available.) [166]

Smooth, uniform, relatively thin hard coatings can be readily and inexpensively applied by using a metallizing gun and Metco-Weld H, a "wire" composed of a powdered hard facing alloy extruded with a plastic binder, which is completely volatilized during the spraying operation. Subsequent fusing with a torch or an attachment on the metallizing gun alloys the coating to the base metal. **Metallizing Engineering Co., Inc.** (Literature available.) [167]

Colmonoy plastic bonded rod is available for the Sprayweld process in ⅛ and 3/16-in. diameters in 5-lb. coils. The rod can be used on the same reel and in the same way as metallic wires. **Wall Colmonoy Corp.** [168]

Brazing and Soldering

Flexarc carbon-arc torch for brazing, soldering, preheating before welding and other light heating comes complete with two 10-ft. flexible welding cable leads attached, one pair of ¼x6-in. carbon electrodes, and one pair of ⅜x6-in. carbon electrodes. **Westinghouse Electric Corp.** [169]

The advantages of bronze over steel and cast iron welding rods for repair of iron and steel parts are emphasized in an attractive and informative booklet on "Bronze Welding" (or brazing) published by **Bridgeport Brass Co.** [170]

Two new silver solders have been developed by **All-State Welding Alloys Co., Inc.**—one containing 40% silver and having a melting point of only 1076° F., and one containing 20% silver, which is economical and has a shear strength of 145,000 psi. [171]

New fluxes include a brazing compound that contains powdered metal mixed with powdered flux, made by **American Solder & Flux Co.** [172]; Thermo-Lo, an anhydrous flux for brazing cast iron, copper, brass, bronze or steel, made by **Farrelloy Co.** [173]; a paste flux for joining aluminum to other metals at low working temperature, made by **All-State Welding Alloys Co.** [174]; and Never-Sever, specifically designed for use on passivated zinc surfaces, marketed by **Chemical Corp.** [175]

A series of paste solders has been developed on the theory that a micro-film of solder will produce a joint of much higher strength than one with a heavy layer of solder. The paste incorporates the flux, cleaner, tinning agent and the solder, and is available in three temperature ranges—200 to 500° F., 500 to 750° F., and 1150 to 2000° F. **Fusion Engineering.** (Literature available.) [176]

Galvalloy is a galvanizing compound that also serves as a tinning agent on magnesium, aluminum or pot metals. **Metalloy Products Co.** (Literature available.) [177]

For furnace brazing of aluminum alloys, **Young Brothers Co.** has developed a continuous, varispeed conveyer oven equipped with a recirculation system and automatic electric heat; temperature is precisely regulated to be close to, without exceeding, the melting point of the aluminum alloys. [178]

An induction heating installation is being used for brazing Coca Cola bottle vending machines with much closer tolerances than the riveting processes formerly used. Twelve different assemblies are brazed on the Ther-Monic equipment used. **Induction Heating Corp.** [179]

Another example of furnace brazing is an assembly described by **Salkover Metal Processing.** A meat grinding knife has body made of stainless steel for toughness and corrosion resistance, with sharp cutting edges of high-carbon, high-chromium toolsteel, permanently brazed together. [180]

Specialized Welding Techniques

Dow Chemical Co. is working closely with equipment manufacturers in developing the process of high-frequency a.c. welding of heavy plate and extrusions made of magnesium. By this method single-pass welds have been made on material thicker than ½ in. without beveling or scarfing of joints. [181]

Foote Mineral Co., Inc., has succeeded in welding ductile zirconium sheet by the Heliarc method using argon; welds are ductile enough to roll. [182]

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with applied stress. The curves of such variation are called "magnetic diagrams of elongation". 11 ref.

9a-7. Method for Evaluation of Plasticity in Notches. (In Russian.) L. M. Pevzner. *Zavodskaya Laboratoriya (Factory Laboratory)*, v. 13, Sept. 1947, p. 1105-1112.

Relationships between deformation characteristics and impact strengths. A few tests were made on magnesium from −195 to 250° C., but most of the work was done on a Cr-Ni-Mo steel. In general changes in plasticity with temperature are not parallel to those in impact strength. 17 ref.

9a-8. The Choice of a Basic Method for Determination of the Hardness of Metals. (In Russian.) M. M. Khrushchov. *Zavodskaya Laboratoriya (Factory Laboratory)*, v. 13, Sept. 1947, p. 1121-1128.

An experimental comparative study of different methods. The Vickers method is considered most exact but the methods of Brinell and Rockwell are recommended in special cases. 13 ref.

9a-9. A 150-Ton Universal Structure Testing Machine. *Engineer*, v. 184, Dec. 26, 1947, p. 594-596.

Construction of a machine designed by W. and T. Avery, Ltd., Birmingham, England.

For additional annotations indexed in other sections, see:
3a-3, 24a-7.

9b — Ferrous

9b-1. Evaluation of Steel for Welded Structures to Be Exposed to Low Temperatures. (In Russian.) A. E. Asnis. *Zavodskaya Laboratoriya (Factory Laboratory)*, v. 13, Sept. 1947, p. 1100-1105.

The impact strength of a special welded test specimen is claimed to indicate satisfactorily the applicability of steels for structural use at temperatures as low as −45° C. Specifications for the specimens; the test method; test results for a series of six steels.

For additional annotations indexed in other sections, see:
3b-4.

9c — Nonferrous

9c-1. Concerning the Applicability of Laboratory Tests for Determination of the Life of Machine Parts. (In Russian.) A. I. Chipizhenko. *Zavodskaya Laboratoriya (Factory Laboratory)*, v. 13, Sept. 1947, p. 1113-1120.

Up to now, no universally accepted coefficient for calculation of wear has appeared. A new coefficient taking into consideration the specific gravity of the metal and the operating conditions is proposed, and a formula is derived which expresses the amount of wear in terms of cu.mm. per sq.cm. of surface under a given load for a "friction path" of 1 km. Results for different bearing metals.

9d — Light Metals

9d-1. Aluminum and Its Applications. Hiram Brown. *Light Metal Age*, v. 5, Dec. 1947, p. 13-20.

Chapter 2 of forthcoming book deals with testing methods and definitions of terms used in testing. 16 ref.

10
ANALYSIS

10a — General

10a-1. Some Applications of Inorganic Chromatography. G. Robinson. *Metallurgia*, v. 37, Nov. 1947, p. 45-47.

Some qualitative and quantitative applications of chromotography, with suggestions for further methods of application to the micro-analysis of alloys. Use of 8-hydroxyquinoline as an adsorbent for Cu, Ni, and Zn. (To be continued.)

10a-2. Effect of Manganese on the Short Iodide Method for Copper. E. T. Pinkney, R. Dick, and R. S. Young. *Journal of the Society of Chemical Industry*, v. 66, Oct. 1947, p. 342.

An explanation is advanced for the inability of some laboratories to secure satisfactory results in the presence of manganese. Precautions necessary to eliminate interference in this ore-analysis method.

10a-3. Salinogenic or Chelate Forming Dyes as Analytical Reagents. A. Steigmann. *Journal of the Society of Chemical Industry*, v. 66, Oct. 1947, p. 353-355.

The diazoamino group was found to be Ag, Hg, and Cd selective. The sulphonamide group present in sulphanilamide and other alpha drugs is similarly reactive. Para diethylaminobenzeneazo chromotropic acid was found to be Ce, Ca, Mg and (under certain conditions) Cu, Ni, and Co selective. 5-(p-nitrobenzeneazo)-7-nitroso-8-hydroxyquinoline (oxin violet) is copper specific and nickel selective. New reactions of nitroso-R-acid; photographic reactions.

10a-4. New Analytical Reactions With Anionic and Cationic Wetting Agents. A. Steigmann. *Journal of the Society of Chemical Industry*, v. 66, Oct. 1947, p. 355-356.

The orthosilicates and metaphosphates of cetyltrimethyl-ammonium bromide ("Cetavlon") or of "Sapamine KW 200%" absorb acid dyes and acid spot-test reagents and therefore provide analytical "trace catchers". Cetavlon also precipitates the anionic complexes of Hg, Au, and Pt from slightly acid or neutral solutions of the metal chlorides. Spot-test papers with Sapamine iodide are very selective for Pt and Pd and more sensitive than those with 2-thiobenziminazole. The oxidation of aromatic amines is greatly influenced by anionic wetting agents.

10a-5. Trends in Quantitative Analysis; A Survey of Papers for the Year 1946. Frederick C. Strong. *Analytical Chemistry*, v. 19, Dec. 1947, p. 968-971.

All research papers published in 1946 and covered in *Chemical Abstracts* prior to September 1947 were studied. The largest number of papers was on volumetric analysis but the number on colorimetry was almost as great; 56% of all papers were on instrumental methods of analysis.

10a-6. Flame Excitation Methods for Quantitative Spectrochemical Analysis. H. C. T. Stace. *British Chemical Digest*, v. 2, Dec. 1947, p. 75-78. Condensed from *Australian Chemical Institute Journal and Proceedings*, v. 14, April 1947.

Scope of the methods indicated by a periodic chart with those elements detectable by flame excitation appearing in two blocked-off areas. The solution and solid techniques. 14 ref.

10a-7. Determination of pH at the Beginning of Precipitation of Columbium and Titanium Hydroxides. (In Russian.) N. G. Klimenko and V. S. Syrokomskii. *Zavodskaya Laboratoriya (Factory Laboratory)*, v. 13, Sept. 1947, p. 1029-1034.

The above pH depends upon the initial concentration of Cb. The range for pentavalent Cb at concentrations between 0.003 and 0.013 gram-atoms per liter was established, as well as that for trivalent Cb and also the effect of variations in temperature up to the boiling point of the solutions. 17 ref.

10a-8. Determination of Columbium in the Presence of Titanium. (In Russian.) V. S. Syrokomskii and N. G. Klimenko. *Zavodskaya Laboratoriya (Factory Laboratory)*, v. 13, Sept. 1947, p. 1035-1037.

Method based on differential hydrolysis. Effects of different precipitants and of variations in pH. The method is claimed to be superior in speed and equal in accuracy to other methods for analysis of a variety of ores and metals.

10a-9. Rapid Method for Determination of Iron and Titanium Dioxide in Vanadium Slags. (In Russian.) B. Ia. Barkov. *Zavodskaya Laboratoriya (Factory Laboratory)*, v. 13, Sept. 1947, p. 1133-1136.

Iron is determined by potentiometric titration using potassium dichromate. Titanium is determined by titration with iron chloride and with ammonium thiocyanate as indicator.

For additional annotations indexed in other sections, see:
11-2-3, 12a-4, 27a-17.

10b — Ferrous Base Metals

10b-1. Spectrographic Analysis of Low-Alloy Steel; A Statistical Examination of Sources of Error. H. T. Shirley, E. Elliott, and Joyce Meeds. *Journal of the Iron and Steel Institute*, v. 157, Nov. 1947, p. 391-409.

Results of a study of a single sample. Readings were taken for Si, Mn, Cr, Ni, and Mo from 30 spectrograms from each of 31 plates taken under conditions involving excitation by means of normal Hilger equipment. Results of some 60,000 readings from over 9000 individual lines were treated statistically to obtain estimates of variability contributions from three main sources: excitation response, small-scale plate variability, and microphotometry

10b-2. The Direct Colorimetric Determination of Tungsten in Cast Iron. W. Westwood and A. Mayer. *Analyst*, v. 72, Nov. 1947, p. 464-469.

Method based on the formation of a yellow tungsten thiocyanate complex in strong HCl in the presence of stannous chloride. The color is measured on the Spekker absorptiometer. Alloying elements in amounts normally present in cast iron do not interfere. 21 ref.

10b-3. Photocolorimetric Method for Determination of Columbium in Steel. (In Russian.) A. L. Davydov, Z. M. Vaisberg, and L. E. Burkser. *Zavodskaya Laboratoriya (Factory Laboratory)*, v. 13, Sept. 1947, p. 1038-1043.

Method is based on a new color reaction—formation of a blue P-Mo-Cb complex.

10b-4. Semi-Micro Determination of Chromium and Vanadium in Ferrous Metals. (In Russian.) B. A. Generozov. *Zavodskaya Laboratoriya (Factory Laboratory)*, v. 13, Sept. 1947, p. 1043-1048.

Semi-micro variations of the volumetric persulphate method suitable for determination of Cr alone, in the absence of V, and for simultaneous determination of Cr and V. 16 ref.

10b-5. Rapid Colorimetric Method for the Determination of Phosphorus in Cast Iron. (In Russian.) K. A. Matveeva. *Zavodskaya Laboratoriya (Factory Laboratory)*, v. 13, Sept. 1947, p. 1136-1137.

Preparation of the colorimetric standards; comparison of the results with those obtained by usual analytical procedures. The method is based on the formation of a blue P-Mo complex whose intensity is proportional to the concentration of phosphorus.

10c—Nonferrous Base Metal

10c-1. The Determination of Calcium Sulphate in Sulphide Ores. R. S. Young and A. J. Hall. *Journal of the Society of Chemical Industry*, v. 66, Oct. 1947, p. 375.

Ammonium chloride solution was found to be a satisfactory solvent for

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Aluminum Co. of America has recently issued its latest edition of "Welding and Brazing Alcoa Aluminum", a 128-page technical manual. [183]

"Welding and Soldering of Armco Stainless Steels" is a 52-page handbook containing information on oxy-acetylene, metallic-arc, resistance, pressure, submerged arc, and other methods of welding stainless steels. Sections on soft soldering, silver brazing, riveting and oxygen cutting are included. **American Rolling Mill Co.** [184]

A newly developed butt welding technique is used by **Micro Metallic Corp.** to join together 6x18-in. sheets of porous stainless steel to form large filters. A modified form of Heliarc welding is used. [185]

The Heliarc process is one of the most suitable for welding Hastelloy and Multimet alloys, and techniques for resistance welding Multimet alloy are in the process of development. A method for pressure welding Hastelloy alloy C pipe has been worked out using a machine developed by Linde Air Products Co. Details of these processes are available from **Haynes Stellite Co.** [186]

A 250-kva. machine equipped with extra-sensitive controls has been used to weld a total of 13.5 miles of copper lengths into a continuous strip for the massive electromagnetic coils of Columbia University's new cyclotron. **American Welding & Mfg. Co.** [187]

A machine that is particularly effective in attaching light wire from a spool to parts fed automatically has been devised by **Tweezer-Weld Corp.** In welding tabs to radio tube cathodes, the machine can produce some 3000 assemblies per hr. without the use of an arbor. [188]

For accurate placement of electrical contact material on contact springs, automatic point or disk welding machines have been announced by **Sheffield Corp.** The spring is loaded in a suitable holding fixture, the disk (in the disk machine) is punched and placed at the proper location on the spring, welded, and the contact shaped to required flatness or contour. [189]

Weld Cleaning and Testing

The Multi-Pic has five separate pick-pointed hammer heads, each free to slide ⅜ in., mounted on a single hammer handle; each of the head segments strikes with equal impact at five different points, regardless of surface contour of the weld. **Bernard Welding Equipment Co.** [190]

The strong construction of knot-type disk center and cup brushes to be mounted on portable tools permits high-speed cleaning of welds. End brushes for welds difficult to reach are also made. **Osborn Mfg. Co.** (Literature available.) [191]

A set of 12 cleaners for acetylene welding tips is contained in an aluminum case; they are specially designed to clean the tips without damaging the ports. **Thermacote Mfg. Co.** [192]

A Petite testing machine for testing spot welds has a capacity of 10,000 lb. with 1000 lb. low range. **Tinius Olsen Testing Machine Co.** [193]

Weld preheating temperatures can be accurately controlled by checking with Tempilstiks 400 and 450° F. Tempilaq and Tempil pellets can also be used for surface temperature measurements in preheating. **Tempil Corp.** and **Claud S. Gordon Co.** (distributor). (Literature available.) [194]

Positioners; Other Accessories

Tanks varying in diameter from 2 to 14 ft. can be automatically welded both circumferentially and longitudinally with the help of a self-propelled turning roll. An electric power-driven turning roll and an idler roll are mounted on separate carriages; the turning roll will rotate the tank for circular welds, or, by engaging a clutch, the tank can be driven along a track for longitudinal welds. **Ransome Machinery Co.** [195]

Power elevation is a new feature of a welding positioner introduced by **Harnischfeger Corp.**, and supplements the mechanisms for tilting and rotation. [196]

With variable speed control on welding positioners, speed can be regulated to conform to size of work, efficiency of the operator, or recommended speed for welding different materials. **Reeves Pulley Co.** [197]

Variable speed equipment is also used in welding rod manufacture to control extrusion presses for flux coating, wire straighteners and cutters, grinding machines and conveyers. **Reeves Pulley Co.** [198]

Exact control over heat, air circulation and humidity is maintained in a welding rod baking oven built by **J. O. Ross Engineering Corp.** Measuring 90 ft. in length, it is a five-pass oven arranged for three zones of control, each of which may be operated at different temperatures. [199]

The Dillon mechanical pressure gage, which has been described in previous issues of *Metals Review*, was developed in 1947 for the express purpose of checking electrode pressure in spot welding machines. It is simple and compact, and registers when placed between the electrodes of the machine and pressure is applied. **W. C. Dillon & Co., Inc.** (Literature available.) [200]

A new Weltronic Water Saver for use with any type of welding machine relieves the operator of the duty of turning on or shutting off the cooling water. The water valve is de-energized (and flow of cooling water stopped) if the welding machine is stopped for a period of 30, 60 or 90 sec.; starting the machine energizes the Water Saver's initiating transformer. **Weltronic Co.** [201]

A portable welding fume exhauster, designed for use where stationary ventilating systems are impractical, weighs only 25 lb.; it is 34 in. long and 10 in. in diameter. **Mine Safety Appliances Co.** [202] Bulletins are also available describing M.S.A. welding helmets and accessory protective and safety equipment.

READER SERVICE COUPON

Check These Numbers for Production Information and Manufacturers' Catalogs. The following numbers refer to the new products and bulletins listed in the preceding article on "Welding Equipment" starting on page 11.

THIS COUPON IS VOID AFTER MAY 1, 1948

Metals Review, February 1948

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anhydrite, and also for gypsum. By this solution, the sulphur contained in base-metal sulphides and barite and the sulphur in the anhydrite can be distinguished. Celestite does not give satisfactory results by this method. The distinction is important in processing a certain South African ore.

10c-2. The Stability of the Cobaltous Thiocyanate Complex in Ethyl Alcohol-Water Mixtures and the Photometric Determination of Cobalt. Norbert Uri. *Analyst*, v. 72, Nov. 1947, p. 478-481.

Stability was determined at various concentrations of ethyl alcohol and ammonium thiocyanate. The degree of dissociation of the complex was calculated on the basis of photometric extinction measurements. Conditions were worked out for the photocolorimetric determination of cobalt by the thiocyanate method in ethyl alcohol and water mixtures. 10 ref.

10c-3. An Indicator Changing at pH 0.5 for the Control of Sulphide Precipitation. H. G. Andrew. *Analyst*, v. 72, Nov. 1947, p. 481-482.

Results of experiments suggest that use of a mixed indicator showing clearly when the pH of a solution is close to 0.5 is advantageous in improving the accurate separation of the Group II metals and also makes aluminum easier to detect.

10c-4. Polarographic Analysis of Zinc Die-Casting Alloys. Milton Sherman. *Die Castings*, v. 6, Jan. 1948, p. 32, 34, 36-37.

Suitability of the above method for rapid analysis of impurities in die-cast metal without sacrifice of accuracy.

10d—Light Base Metals

10d-1. Polarographic Determination of Lead in Aluminum Alloys. William Stross. *Metallurgia*, v. 37, Nov. 1947, p. 49-51.

Rapid and simple method based on work by Kolthoff and Matsuyama, which is applicable to lead contents from less than 0.05 to approximately 3%. The metal is dissolved by HCl. Interference of tin is prevented by oxidation, that of iron by reduction at controlled pH, and copper is precipitated.

10d-2. An Investigation Into Factors Affecting the Sodium Carbonate Fusion of Beryl. G. H. Osborn. *Analyst*, v. 72, Nov. 1947, p. 475-478.

Used in the analysis of beryl for beryllium. 13 ref.

10d-3. Micro-Spectrochemistry of Aluminum Alloys. D. P. Jensen. *Iron Age*, v. 161, Jan. 8, 1948, p. 66-68.

An interesting application is a procedure for studying diffusion in clad aluminum alloy sheet at thickness intervals of about 0.001 in., commencing 0.001 in. from the surface. Simple, rapid, and accurate, the method can be readily performed with standard spectrographic equipment.

10d-4. Die Spektrographische Betriebsanalyse von Aluminium und Seinem Legierungen. (Spectrographic Analysis of Aluminum and Its Alloys.) G. Winkler. *Chimia*, v. 1, Dec. 15, 1947, p. 248-252.

Four methods. Numerous references to U.S. work.

11
APPARATUS, INSTRUMENTS and METHODS

11-1. The Vapor Pressure of Metals. Rudolf Speiser. *Engineering Experiment Station News* (Ohio State University), v. 19, Dec. 1947, p. 12-20.

Experimental techniques; Langmuir's rate-of-evaporation method, Knudsen's rate-of-effusion method; equipment used. Determination of the accommodation coefficients of beryllium and graphite and the thermodynamics of the equilibrium between solid and gaseous beryllium.

11-2. Symposium on Statistical Methods in Experimental and Industrial Chemistry. B. L. Clarke. *Analytical Chemistry*, v. 19, Dec. 1947, p. 943-955; discussion, p. 956-960.

Introductory Remarks, by B. L. Clarke; The Management Viewpoint, by George F. Smith; Technique for Testing the Accuracy of Analytical Data, by W. J. Youden; Design of Experiments in Industrial Research, by Hugh M. Smallwood; Statistical Training for Industry, by S. S. Wilks; prepared discussions by John W. Tukey, C. West Churchman, Grant Wernimont, and John Mandel. 15 ref.

11-3. Control of the Accuracy and Precision of Industrial Tests and Analyses. James A. Mitchell. *Analytical Chemistry*, v. 19, Dec. 1947, p. 961-967.

The control-chart procedure and its application; examples of its use in controlling the accuracy and precision of production chemical tests and analyses. (Presented at 11th Meeting of American Chemical Society, Atlantic City, N. J.)

11-4. A Transparent-Replica Technique for Interferometry. R. C. Faust and S. Tolansky. *Proceedings of the Physical Society*, v. 59, Nov. 1, 1947, p. 951-957.

A transparent-replica technique which allows the surface of an opaque body to be examined interferometrically using the transmitted multiple-beam fringe pattern. A replica made from methyl methacrylate polymer is found to reproduce features both in extension and in depth to within close limits. The technique was tested and applied to the examination of a coarsely polished metal surface. Further possibilities in examination of the surfaces of polished metals.

11-5. Testing Anodic Coatings. *Metal Industry*, v. 71, Dec. 19, 1947, p. 505.

Methods used for oxide coatings on aluminum alloys; measurement of thickness by the filmeter as described by Mason and Cochran, *ASTM Bulletin*, Oct. 1947.

11-6. Electronic Counters Return First Cost in Seven Months. *Factory Management and Maintenance*, v. 106, Jan. 1948, p. 71.

Use of the above to measure the output of 34 forging presses.

11-7. Taper-Setting Instrument Uses Resistance Strain Gages. George N. Levesque and Harold S. Sizer. *Electrical Manufacturing*, v. 41, Jan. 1948, p. 101-103, 184.

Position of the pivoted table on a universal cylindrical grinding machine is accurately set by correcting measured error in trial setting through use of extremely precise electric gages.

11-8. Magnetic "Texture Meter". (In Russian.) K. V. Grigorov. *Zavodskaya Laboratoriya (Factory Laboratory)*, v. 13, Sept. 1947, p. 1073-1079.

Method and equipment developed for determining variations from the desired crystal structure in sheet steel based on variations in the magnetic anisotropy. Theoretical basis of the method; results of typical tests.

11-9. Investigation of the Structure of Steel by Means of Analysis of Oscillograms. (In Russian.) K. M. Bol'shova. *Zavodskaya Laboratoriya (Factory Laboratory)*, v. 13, Sept. 1947, p. 1079-1086.

The work was undertaken because of the need for closer standardization in the heat treatment of tool steel. The method is applicable mainly to the surface layer, and was proposed by N. C. Akulov in 1934.

11-10. Determination of the Number of Grains per Unit of Volume in Alloys. (In Russian.) S. A. Saltykov. *Zavodskaya Laboratoriya (Factory Laboratory)*, v. 13, Sept. 1947, p. 1086-1095.

Existing methods; improvements developed in the U.S.S.R.; practical applications on an industrial scale.

11-11. Means for Preparation of Microsections of Alloys Which Oxidize Rapidly. (In Russian.) E. A. Boom. *Zavodskaya Laboratoriya (Factory Laboratory)*, v. 13, Sept. 1947, p. 1139-1140.

A method suitable for alloys in which one of the components is an alkali or alkaline-earth metal, and especially suitable for Li-Si alloys containing 50 to 70% Si.

11-12. Use of Bauman's Method for Demonstrating the Heterogeneity of Structure of Cast Iron. (In Russian.) M. A. Shapiro. *Zavodskaya Laboratoriya (Factory Laboratory)*, v. 13, Sept. 1947, p. 1140-1141.

The above method, which has been widely applied to steels, was also found to be useful for determining the location and type of inclusions and other inhomogeneities in centrifugally cast engine cylinders. Its applicability for other cast iron parts.

11-13. Control of the Quality of Surfaces by a Printing Method. (In Russian.) N. M. Ziuskin. *Zavodskaya Laboratoriya (Factory Laboratory)*, v. 13, Sept. 1947, p. 1143-1145.

A system for photographing flaws and irregularities in surfaces, especially in cramped locations, such as inside gun barrels.

11-14. Mechanical Tensometer for Determination of Deformation in Bodies During Temperature Changes. (In Russian.) N. N. Prokhorov, N. V. Shiganov, and A. V. Mordvintseva. *Zavodskaya Laboratoriya (Factory Laboratory)*, v. 13, Sept. 1947, p. 1148-1149.

Apparatus described and diagrammed; typical results obtained.

11-15. Electron Optics. G. I. Finch and H. Wilman. *Science Progress*, Jan. 1948, p. 1-12.

Principles, methods, and applications of electron microscopy.

11-16. Some Applications of Electronics in Metrology. E. J. B. Willey. *Science Progress*, Jan. 1948, p. 55-65.

A review of applications to precise measuring devices. 21 ref.

11-17. Instrumentation. Ralph H. Munch. *Industrial and Engineering Chemistry*, v. 40, Jan. 1948, p. 83A-84A.

A new type of pneumatic actuator and a new thermocouple for use in reducing atmospheres.

12
INSPECTION & STANDARDIZATION

12a — General

12a-1. Measuring Large Precision Parts. N. N. Sawin. *Machinery* (London), v. 71, Nov. 13, 1947, p. 541-544.

Results of experiments designed to develop a satisfactory procedure.

12a-2. Testing of Flatness by the Beam Comparator Method. R. Marriener and W. O. Jennings. *Machinery Lloyd* (Overseas Edition), v. 19, Nov. 22, 1947, p. 99-102.

Method developed in Britain during the war for testing quickly and with reasonable accuracy large batches of plates of the same size.

12a-3. Portable Ultrasonic Thickness Gage. Norman G. Branson. *Electronics*, v. 21, Jan. 1948, p. 88-91.

Instrument by which thickness of empty or full pipes and tanks, or metal

(Turn to page 22)

Aborn Differentiates Between Weldability & Weld Performance

Reported by Melvin R. Meyerson
National Bureau of Standards

"Yesterday, Today, and Tomorrow of Welding" was the subject of an enthusiastically received lecture by R. H. Aborn of the U. S. Steel Corp. Research Laboratory presented before a joint meeting of the Washington Chapters of A.S.M. and the American Welding Society on Dec. 8.

Stating that welding is usually considered as the joining of metals by mutual melting, Dr. Aborn suggested a new approach to the difficult-to-define term "weldability", by differentiating the making of a weld from its performance. Weldability is then defined as the ability to make a sound joint free from cracks or other significant defects, and weld performance may be defined as how well the weld performs its intended function. Tests used to measure weldability include the underbead crack test, double-T test, and the restraint test, while tests used to check performance include tensile impact and slow bend.

The speaker divided steels according to weldability into three classes—those readily weldable (carbon steels with less than 0.30% carbon, and low-alloy steels with carbon under 0.15%); those weldable with proper precautions (carbon steels with 0.35 to 0.50% carbon, and low-alloy steels with 0.15 to 0.30% carbon); and steels difficult to weld (carbon steels with more than 0.50% carbon, and alloy steels with more than 3% of alloy).

Two types of cracks are found in welded metals, namely hot and cold cracks. Dr. Aborn described the properties of weld metal obtained from the three principal nonpressure processes used in ferrous welding: the bare metal arc, the shielded metal arc, and oxyacetylene welding. Oxygen, nitrogen, and hydrogen contents of both the filler metal and the base metal have a pronounced influence on the properties of the weld.

Alloy filler metal is generally used where tensile strength requirements exceed 70,000 psi. In selecting filler metal for the higher alloy steels, compositions should be as similar as practicable; the farther apart the compositions, the greater the chance for trouble.

Other phases of welding covered by the talk included the relationships of temperature, microstructure and cooling in mild steel plate, the microstructural zones in heat-affected base metal, the factors influencing cooling of a weld, relative cooling rates of different types of welding, and the cause and effect of dimensional changes.

Dr. Aborn concluded with a prediction of what tomorrow will bring to welding. We may expect improved versatility of electrodes to provide the same heat treating characteristics in the weld as in the base metal. Use of automatic processes will continue to expand. In the more distant future, atomic-fission welding, using atomic fission as a source of heat, may become practicable.

Prior to the technical talk, Rear Admiral Clinton E. Braine, deputy chief, materials division, Executive Office of the Secretary, Navy Department, stressed the need for governmental and industrial preparedness and alertness. He urged that an idea not be wasted merely because it does not lie within the field of endeavor of the individual or agency, or the limitations of the physical plant. Instead the idea should be channeled to the place where it can be properly utilized.

Book List Postponed

Publication of the ten-year book list compiled at Massachusetts Institute of Technology, which was to have been started in this issue of *Metals Review*, has been postponed until March. By starting in that issue, all of the installments will be printed on quality paper suitable for clipping and filing.

Quality of Inert-Gas Welds Depends on Gas Purity

Reported by Kenneth O. Uran
Production Contol Manager
Columbian Enameling & Stamping Co.

Inert-gas arc welding is not a new idea, Arthur N. Kugler of Air Reduction Sales Co. pointed out after reviewing the history of the process. Mr. Kugler addressed the December monthly meeting of the Terre Haute Chapter. The widespread, wartime use of magnesium alloys and the welding thereof led to the initial practical application as a matter of sheer necessity. From this start the process has expanded to many commercial operations on other metals.

Mr. Kugler showed how many of the inconsistencies in the weld have been traced to the impurity of the inert gas being used; the purity required is much higher than that used for normal medicinal and other purposes. All metals can be welded to some extent by this process, but aluminum and stainless steel were cited as outstanding successes.

The process has been known by many different names, prominent among these being Heliweld, Heliarc and Argonarc welding. A recent advance has been the development of automatic units which control the voltage to ± ¼ to ½ volt.

In conclusion, Mr. Kugler mentioned as advantages that most metals, in thin gages, can be welded without filler rod, and many metals can be welded at much higher rates than by any other commercial method. Metals that normally require a flux may be welded by this process without flux.

Compliments

To WILLIAM B. WALLIS, president of Pittsburgh Lectromelt Furnace Corp., on his nomination for president of the American Foundrymen's Association, and to EDWIN W. HORLEBEIN, president of Gibson & Kirk Co., on his nomination as vice-president.

To R. G. MCELWEE, iron foundry division manager for Vanadium Corp. of America, on his selection to receive the John A. Penton Medal of the American Foundrymen's Association at the 1948 Foundry Congress next May. Also to PETER E. RENTSCHLER, president-treasurer of Hamilton Foundry & Machine Co., on the award of the Peter L. Simpson Medal of the A.F.A.

To JOHN B. CAINE, metallurgist, Sawbrook Steel Castings Co., on his election as chairman of the Electric Furnace Steel Committee of the American Institute of Mining and Metallurgical Engineers.

To the Geneva plant of United States Steel Corp. and its president, WALTHER MATHESIUS, a former national trustee, on its postwar accomplishments and influence on western industry as portrayed in a recent booklet, "The New Industrial West—a Report by U. S. Steel".

To DANIEL E. KRAUSE of Battelle Memorial Institute on being appointed executive director of the Gray Iron Research Institute in Columbus, Ohio.

To A. B. KINZEL, vice-president, Union Carbide and Carbon Research Laboratories, on his re-election as chairman of the Engineering Foundation.

Metallizing Association Formed

An "American Metallizing Contractors Association" has been organized as the culmination of a meeting between representatives of eight of the country's largest metallizing contract shops at St. Louis, Mo., on Dec. 5 and 6. Among the more important functions of the association is to act as a central clearing for technical information concerning applications and the techniques employed. A set of minimum standards governing various applications of the metallizing process will be formulated.

sheets, is quickly measured to 1% accuracy. A frequency-modulated oscillator provides an audible indication of plate-current peaks when the oscillator is tuned to fundamental or harmonic thickness resonance with material under test. Indicating dial shows steel thickness directly.

12a-4. Inspection and Testing. *Steel,* v. 122, Jan. 5, 1948, p. 211-212, 215.

Brief reviews of recent developments: Industrial X-Ray Saves Manufacturer $250,000, by R. G. Tobey; X-Rays Gage Hot Strip Steel During High-Speed Rolling, by W. C. Hutchins; Recognizes Importance of Basic Government Research, by George Sachs; Surface Roughness Measurement by Facsimile Eliminates Dispute, by J. Manuele; Spectrochemical Analysis Now by Direct Intensity Measurement, by W. B. Coleman; Use of Statistical Methods Grows as Inspection Tool, by J. R. Steen; Servo-Mechanism With Recorder Weighs Mine Cars in Lengths, by W. R. Daniels; Oxygen in Openhearth Sets Need for Closer Charge Control, by Charles R. Funk; Predicts 2% of Gross Sales to be Earmarked for Research, by C. O. Dohrenwend; Sees Buyers' Market in Very Near Future, by Sam Tour.

12a-5. X-Ray Inspection of Spot Welds. Robert C. McMaster. *Welding Engineer,* v. 33, Jan. 1948, p. 54-58.

Nondestructive radiographic inspection which can be carried out at any point in the fabrication process as applied to nearly all sheet metals.

12a-6. The Inspection of Spot Welds. *Machinery Lloyd* (Overseas Edition), v. 19, Dec. 6, 1947, p. 68-72.

General principles of spot welding and inspection methods. Practical applications for mild steel and aluminum alloys. The "Metroflux", captive-fluid, magnetic-detector cell for testing spot welds in stainless steels.

12a-7. Checking Angle Gages During Manufacture. E. S. Tebbutt. *Machinery* (London), v. 71, Dec. 4, 1947, p. 630.

12a-8. Acceptance Standards in Radiographic Examination of Castings and Welds. *Engineer,* v. 184, Dec. 12, 1947, p. 551.

Summarizes the discussion which took place at a meeting of the Industrial Radiology Group of the Institute of Physics, London, Nov. 8, 1947.

12a-9. Defects and Preventives in Weld Radiographs. *Iron Age,* v. 161, Jan. 15, 1948, p. 73. Reprinted from article by L. Mullins, *Transactions of the Institute of Welding,* Oct. 1947.

A tabulation.

12a-10. Checking Internal Gear Sizes by Measurement Between Wires. Even Numbers of Teeth. Odd Numbers of Teeth. *Machinery* (London), v. 71, Dec. 18, 1947, p. 698; Dec. 25, 1947, p. 724.

Two tables.

12a-11. Fixtures for Casting Qualification. Part II. A Program for Casting Qualification. A. H. Blacker. *Tool & Die Journal,* v. 13, Jan. 1948, p. 52-55, 92, 94.

Planning the program and design of the fixtures.

12a-12. Air Jets; Their Characteristics for Gaging Devices. R. S. Elberty. *Machine Design,* v. 20, Jan. 1948, p. 111-114.

Fundamental principles.

12b — Ferrous

12b-1. First Progress Report on Nondestructive Testing of Drill Pipe. L. R. Jackson, H. M. Banta, R. C. McMaster, T. P. Nordin, and G. T. Muehlenkamp. *Drilling Contractor,* v. 4, Dec. 15, 1947, p. 54-55, 72.

American Association of Oilwell Drilling Contractors has authorized Battelle Memorial Institute to conduct an investigation of methods for nondestructive testing of oil-well drill pipe. The facilities and research program.

12b-2. Special Tools Torsion-Test Lockwashers Correctly. H. Greenberg. *American Machinist,* v. 92, Jan. 15, 1948, p. 87.

Simple apparatus claimed to give correct and reproducible results superior to the S.A.E. "vise and monkey wrench" method.

12c — Nonferrous

12c-1. The Proving of New Dies for Die Casting. *Machinery* (London), v. 71, Dec. 25, 1947, p. 738.

Recommended inspection procedures.

For additional annotations indexed in other sections, see:
8-4, 27a-10, 27b-4.

13 TEMPERATURE MEASUREMENT and CONTROL

13-1. A Note on Optical Pyrometry. Robert Weil. *Journal of the Iron and Steel Institute,* v. 157, Nov. 1947, p. 415-416.

The effect of variation with temperature of emissivity. Under certain circumstances it may be possible to express this variation in terms of changes of electrical resistivity in the near infrared and visible parts of the spectrum.

13-2. Roof Pyrometers. T. Land. *Iron and Steel,* v. 20, Nov. 20, 1947, p. 559-561; discussion, p. 629-631.

A photo-electric type for openhearth furnaces.

13-3. Instrumentation; Control of Openhearth Furnaces. G. Reginald Bashforth. *Iron and Steel,* v. 20, Dec. 1947, p. 639-643.

The pros and cons of use of instruments for combustion control; reversal control; roof-temperature control; and furnace-pressure control. Principles of some of the devices and systems.

13-4. An Alternating Current Potentiometer of the Polar Type Together With an Alternating Current "Standard Cell". F. H. Gage and G. J. Phillips. *Philosophical Magazine,* 7th Series, v. 38, June 1947, p. 398-408.

Phase-splitting and phase-shifting circuits. An a.c. "standard cell" of the thermal type. Adjustment and calibration of the complete instrument. 11 ref.

13-5. Stralingspyrometrie. (Radiation Pyrometry.) H. C. den Daas and F. van Wiijk. *Metalen,* v. 2, Nov. 1947, p. 45-49.

Methods used in optical and radiation pyrometry. Results with different types.

For additional annotations indexed in other sections, see:
11-17.

14 FOUNDRY PRACTICE

14a — General

14a-1. Constructing Patterns to Favor Molding. *Foundry Trade Journal,* v. 83, Nov. 13, 1947, p. 218.

Design of pattern and mold for base-frame casting.

14a-2. Plastic Patterns; Advantages and Limitations in the Metallurgical Field. E. J. McAfee. *Metal Industry,* v. 71, Nov. 21, 1947, p. 419-421.

Previously abstracted from *American Foundryman.* See 14-207, R.M.L., v. 4, 1947 (*Metals Review,* Sept. 1947).

14a-3. Metal Shrinkage. H. T. Angus. *Machinery Lloyd* (Overseas Edition), v. 19, Nov. 22, 1947, p. 68-73.

The shrinkage which takes place on solidification, from the point of view of the foundryman. The mechanism of cooling and the use of various devices for directional solidification.

14a-4. Mechanizing the Foundry. C. B. Dick. *American Foundryman,* v. 12, Dec. 1947, p. 22-31.

Examples from recent modernization of the Trafford Foundry of Westinghouse, which makes gray-iron castings. Corerooms; molding floors; baking and finishing of cores; sand supply and distribution; facilities for large molds; metal melting; finishing department; and others.

14a-5. Casting. *Steel,* v. 122, Jan. 5, 1948, p. 194-197.

Brief reviews of new developments: Predicts Better Finishes for Gray-Iron Castings, by W. L. Seelbach; Foundries Pay Attention to Basic Scientific Principles, by H. A. Schwartz; Casting Porosity Eliminated by Inert-Gas Flushing, by P. M. Hulme; Cites Advantages of Continuous Casting Copper-Base Alloys, by E. W. Lovering; Suggested Remedies to Help Overcome Foundry Handicaps, by A. W. Gregg; Foundry Research Concentrates on Reducing Over-All Costs, by Oliver Smalley; Die Casting Applications Extended to New Fields, by R. W. Dively; Higher Freight Rates Force Foundry Sand Reclamation, by John Howe Hall; Steelmaking Methods to Benefit Through Casting Research, by Charles W. Briggs; Malleable Iron Industry to Need More Pig Iron in 1948, by James H. Lansing; 1947 Die Casting Output in Excess of War Period, by Charles Pack; Cost and Scarcity of Labor Compels Operational Study, by P. J. Potter; and New Developments Noted in Ferrous Foundry Industry, by E. B. Sherwin.

14a-6. Cutting Maintenance Costs on Air Equipment. (Continued.) D. S. Linton. *Foundry,* v. 76, Jan. 1948, p. 90-93, 222, 224, 226, 228, 230, 232.

How to keep compressors and air-operated tools in proper working order. (To be concluded.)

14a-7. Mechanized Pouring in a Swedish Foundry. I. Forsland. *Foundry,* v. 76, Jan. 1948, p. 188-189.

Disputes claim that a Buick Motor Co. installation was the first of its kind in a production gray-iron foundry. A similar installation has been in use since 1934 in the SKF foundry, Katrineholm, Sweden.

14a-8. Precision Investment Casting and Its Futures. D. F. B. Tedds. *Foundry Trade Journal,* v. 83, Dec. 4, 1947, p. 281-288, 290.

Details of process using a fine refractory material which invests a wax pattern which is melted or burned away without leaving a residue. Present status and future prospects, including costs. (Presented to meeting of Bristol and West of England Branch of the Institute of British Foundrymen.)

14a-9. A New Molding Process. *Foundry Trade Journal,* v. 83, Dec. 4, 1947, p. 289-290. Based on F.I.A.T. Final Report No. 1168.

New German process for making molds and cores. The material used is high-grade silica sand and plastic binder.

14a-10. High-Speed Die Closure With Hydraulic System. *Product Engineering,* v. 19, Jan. 1948, p. 102-103.

System for opening and closing dies

(Turn to page 24)

Ductility Used as Measure of Weldability In New Test Described by Lytle

Reported by Scott L. Henry
A. O. Smith Corp.

Weldability was defined as the ductility of the complete weldment by A. R. Lytle, research engineer for Union Carbide & Carbon Research Laboratories, Inc., at the November meeting of the Milwaukee Chapter ⚙.

Failure of armor and ships by brittle fracture at or near weldments prompted several research programs, according to Mr. Lytle. A review of various testing methods indicated that none of the existing weldability tests were adequate. Loss of ductility is influenced by mechanical defects, hardening, rate of loading, restraint and temperature. With this in mind, the author presented a test procedure which incorporates all of the variables that influence ductility and thus can be used as a measure of weldability.

A notched plate bend specimen 3 in. wide and 8 in. long was used in these tests, to be bent with the notch in tension on a 4½-in. span. With the test specimen equal in thickness to the plate thickness, the mass effect duplicates service conditions. A single bead weld is deposited longitudinally along the center of the specimen under conditions more severe than usually encountered in the field. Welding under these conditions introduces all of the metallurgical and chemical effects into the specimen. The slotted 45° V-notch, 0.05 in. deep with 0.01-in. radius, is milled with a fly cutter across the width of the specimen and provides the restraint. The notch usually comes within 0.02 in. above the junction line of the weld deposit and plate material.

Mr. Lytle presented transition temperature data which showed that many factors contribute to loss of ability to deform plastically. Transition temperature from brittle to ductile fracture is difficult to define for any of the test methods used. A more suitable method is to measure the lateral contraction $\frac{1}{32}$ in. below the notch after failure, and to define arbitrarily the transition temperature as the point on the curve at which there is 1% lateral contraction.

This definition of embrittling temperature is based on engineering judgment and agrees well with the embrittling temperature found under service conditions. There is no exact definition of the degree of ductility, Mr. Lytle emphasized, and this index of that property has a factor of safety, in that there is ductility at 1% lateral contraction.

This slow bend test can be used as a measure of weldability, by using only a single test temperature rather than a series of temperatures, the speaker pointed out. For structures intended for indoor service (at moderate temperatures), a test temperature of −20° C. should be used. For outdoor service, where low temperatures prevail, a test temperature of −40° C. would be safe.

Mr. Lytle enumerated some of the factors which may lower the embrittling temperature, such as deoxidizing of the heat, fine grain size, substitution of alloy for carbon to give equal strength, and stress-relieving. The designer can lower the degree of restraint in the member or structure by removing notches, or by redesign so that the embrittling temperature is lowered.

Dixon Forms Own Company As Representative in East

Harrison I. Dixon has formed his own company known as Metallurgical Products Co. in Brookline, Mass. He will act as representative in New England and New York for A. F. Holden Co., A. S. Richards Co., Stanwood Corp., Michiana Products Corp. and the North American Mfg. Co.

Graduating from University of Michigan in 1924, Mr. Dixon's first job was as metallographer for General Motors Research Laboratories. Subsequently he was assistant chief metallurgist for Crucible Steel Co. of America in Pittsburgh, field test engineer for New Jersey Zinc Co., with Electro Alloys Co., vice-president and sales manager of Park Chemical Co., vice-president and sales manager of Sterling Alloys, Inc. He has been instrumental in the design and fabrication of many new types of alloy castings, some of which operate at temperatures up to 2300° F.

Metallurgical Profession Surveyed; Large Forgings Of Light Metals Described

Reported by R. E. Christin
Metallurgist, Columbus Bolt Works Co.

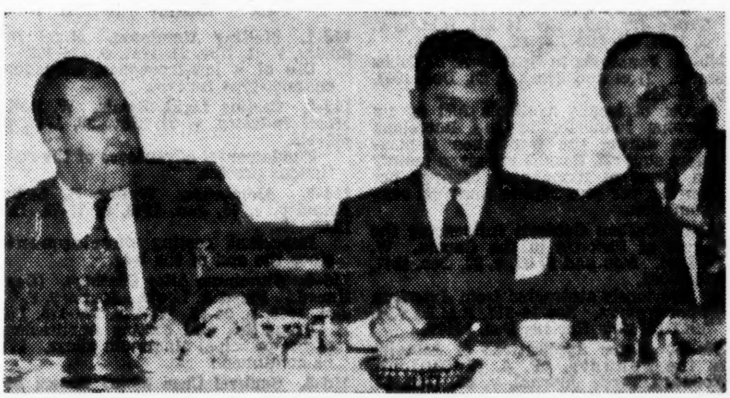
Metallurgy as a profession was the subject of a coffee talk presented at the December meeting of the Columbus Chapter ⚙ by William A. Mueller, professor of metallurgy at Ohio State University. He described the metallurgical curriculum and the increased interest evidenced by the student body. O.S.U. now has 97 men enrolled in metallurgy (with 22 seniors) and five men in the graduate school ready to receive their master's degrees in metallurgical engineering.

A recent survey shows that, of the 350 men graduated since 1923, only three are not following their profession. Of the men studying metallurgy, 90% are from families interested in the iron and steel industries in Ohio.

Examples of metallurgical progress cited by Professor Mueller are the processing of present-day ores of low metal content, such as iron pyrites and copper ores. The field today is far broader because of the research into atomic energy, he said.

For the main talk of the evening A. J. Pepin, assistant to the vice-president, Wyman Gordon Co., presented an illustrated description of large forgings made of aluminum and magnesium, some of which weigh over 500 lb. They are fabricated in the company's new 18,000-ton press—the largest in the world outside of a 30,000-ton press in Germany. The cast steel head of this press weighs 348,000 lb. Some of the problems posed by such large forgings were described.

Fontana Speaks at Dayton



Left to Right at the Dayton Chapter Dinner Meeting on Dec. 10 Are Stewart DePoy, Chapter Chairman; Mars G. Fontana, Professor of Metallurgical Engineering and Director of the Corrosion Research Laboratory at Ohio State University; and W. T. Bryan of the Duriron Co. Dr. Fontana presented the main address of the evening on corrosion and corrosion research; the text of his talk has been outlined in past issues of Metals Review

at the rate of 750 in. per min. on an automatic die casting machine.

14a-11. Precision Molding. *Metal Industry*, v. 71, Dec. 19, 1947, p. 506. Based on recent F.I.A.T. Report.

Recent German developments in the production of sand molds.

14a-12. Een Methode van Kernoliezand-bereiding. (A Method of Core Oil-Sand Preparation.) J. van Yperen. *Metalen*, v. 2, Dec. 1947, p. 79-81.

A method used in a Dutch factory.

For additional annotations indexed in other sections, see: 24a-20.

14b — Ferrous

14b-1. Ferrous Die Castings. C. D. Pollard, H. A. Redshaw, and C. A. Payne. *Foundry Trade Journal*, v. 83, Nov. 20, 1947, p. 237-245; Nov. 27, 1947, p. 259-264; discussion, p. 264-268.

The Eaton Erb continuous casting process and equipment. Auxiliary equipment and performance data. (Presented at Annual Conference of Institute of British Foundrymen, Nottingham, June 1947.)

14b-2. Steel Turbine Castings; Production Problems. John A. Wettergreen. *American Foundryman*, v. 12, Dec. 1947, p. 51-54.

Experience in the foundries and pattern division of General Electric.

14b-3. Steel. Charles W. Briggs. *Foundry*, v. 76, Jan. 1948, p. 66-69, 183-184, 186.

Important casting developments since the end of the war. 38 ref.

14b-4. Malleable Iron. James H. Lansing. *Foundry*, v. 76, Jan. 1948, p. 74-77.

Important casting developments since the end of the war.

14b-5. Gray Iron. James S. Vanick. *Foundry*, v. 76, Jan. 1948, p. 82-89, 132, 134, 136, 138, 140, 142.

Important casting developments since the end of the war.

14b-6. Designs Small Cupola for Fast Melting. V. V. Rogers. *Foundry*, v. 76, Jan. 1948, p. 216-218, 220.

Construction and operation of Australian cupola designed to carry approximately 2800 lb. when loaded to the charging door. By calculation and by experiment, the output was increased from 3360 to 6160 lb. per hr. Repair procedures.

14b-7. The Manufacture of Cast-Steel Bomb-Bodies. Percy H. Wilson. *Engineering*, v. 164, Nov. 21, 1947, p. 501-503; Nov. 28, 1947, p. 525-527; Dec. 5, 1947, p. 550-552.

Previously abstracted from *Foundry Trade Journal*. See 14-361, R.M.L., v. 4, 1947 (*Metals Review*, Jan. 1948).

14b-8. Foundries in Spain. A. J. Gibbs Smith. *Iron and Steel*, v. 20, Dec. 1947, p. 643-644.

Use of locally available fuel by six ferrous foundries in the Barcelona area during the war when imports were shut off. Results are given mainly in terms of tonnage of castings per worker, per cent rejects, and fuel consumption.

14b-9. Carbon Control; Influencing the Degree of Pick-Up in the Cupola. W. W. Levi. *Iron and Steel*, v. 20, Dec. 1947, p. 659-662.

Previously abstracted from *American Foundryman*. See 14-317, R.M.L., v. 4, 1947 (*Metals Review*, Dec. 1947).

14b-10. Some Applications of Asbestos in the Foundry. F. J. McCulloch. *Foundry Trade Journal*, v. 83, Dec. 11, 1947, p. 309-310.

Certain technical difficulties encountered in the production of three different types of iron castings were finally overcome by the use of asbestos yarn or sheet.

14b-11. The "C" Process of Foundry Mold Production. *Machinery* (London), v. 71, Dec. 18, 1947, p. 693. Based on F.I.A.T. Report No. 1168.

Method especially suitable for the casting of small pipe fittings which were formerly made in malleable iron but can now be cast in steel.

14b-12. Pattern Equipment for Mechanized Production in a Light Castings Foundry. James A. McIntosh. *Foundry Trade Journal*, v. 83, Dec. 18, 1947, p. 327-330.

14b-13. Cast Iron Roller Conveyers. J. Timbrell. *Foundry Trade Journal*, v. 83, Dec. 18, 1947, p. 333-336.

Method for making rollers which require no machining before assembly.

14b-14. Centrifugal Casting of Carbon and Stainless Steel Tubes. J. W. Moore and J. W. MacKay. *Machinery*, v. 54, Jan. 1948, p. 181-183.

Previously abstracted from July 1947 issue of *Mechanical Engineering*. See 14-203, R.M.L., v. 4, 1947 (*Metals Review*, Aug. 1947).

14b-15. Centrifugally Cast Steel. *Engineer*, v. 184, Dec. 26, 1947, p. 600.

Critically reviews recent papers.

For additional annotations indexed in other sections, see: 2b-10, 27b-2.

14c — Nonferrous

14c-1. Die Casting Progress. Part I. The Industry. A. C. Street. *Metallurgia*, v. 37, Nov. 1947, p. 3-6.

(To be continued.)

14c-2. Bronze Sand Castings; Porosity Control and Pressure Tightness. W. A. Baker. *American Foundryman*, v. 12, Dec. 1947, p. 46-49.

Previously abstracted from *Metal Industry*. See 14-222, R.M.L., v. 4, 1947 (*Metals Review*, Sept. 1947).

14c-3. Brass and Bronze. Walter W. Edens. *Foundry*, v. 76, Jan. 1948, p. 78-81, 121.

Important casting developments since the end of the war.

14c-4. Tin Bronzes; Effects of Impurities in the Chill-Cast Condition. K. Winterton. *Metal Industry*, v. 71, Dec. 12, 1947, p. 479-482; Dec. 19, 1947, p. 507-509.

Investigation of the effects of some common impurities on the casting, and mechanical and physical properties, of nine bronzes. An oxidation-reduction treatment was used in melting and the alloys were cast by slow controlled pouring. 17 ref.

For additional annotations indexed in other sections, see: 12c-1.

14d — Light Metals

14d-1. Melting Aluminum. *Metal Industry*, v. 71, Nov. 21, 1947, p. 425-426.

Use of a low-frequency, induction, channel-type furnace.

14d-2. Casting Light Metals. W. Roth. *Metal Industry*, v. 71, Nov. 28, 1947, p. 443-446.

Fundamental advantages of the continuous process.

14d-3. Aluminum. Walter E. Sicha. *Foundry*, v. 76, Jan. 1948, p. 70-73, 124, 126.

Important casting developments since the end of the war.

14d-4. Aluminum Alloy Castings. (Continued.) Floyd A. Lewis. *Foundry*, v. 76, Jan. 1948, p. 94-98, 171-172, 174-175, 178.

Properties and casting applications of the principal aluminum alloys. (To be continued.)

14d-5. Squirrel Cage Motor Rotors Die Cast With High Economy. Robert J. Reel. *Electrical Manufacturing*, v. 41, Jan. 1948, p. 96-100.

Production of over 250 rotors per hr. by casting nearly pure aluminum in dual cavities in nitrided dies.

14d-6. Il Disegno dei Getti di Alluminio: Norme per il Progettista. (The Design of Aluminum Molds: Rules for the Planner.) *Alluminio*, Sept-Oct. 1947, p. NdO99-NdO118.

The various shapes and materials for molds for aluminum casting, with emphasis on improved quality. 12 ref.

14d-7. Automatic Gravity Casting. *Metal Industry*, v. 71, Dec. 26, 1947, p. 520-521. Based on paper by M. Bouret presented at 21st Congress of the Association Technique de Fonderie, Paris.

A French development for aluminum alloys.

14d-8. Die Casting Magnesium. *Metal Industry*, v. 71, Dec. 26, 1947, p. 529. Based on recent B.I.O.S. report.

Production methods used by a certain German plant.

15
SCRAP & BYPRODUCT UTILIZATION

15a — General

15a-1. Treating Plating Room Wastes From Die Casting. Finishing Operations. *Die Castings*, v. 6, Jan. 1948, p. 59-60, 62, 72. Condensed from paper by George E. Barnes.

The fundamental features of a multi-purpose treatment works for complete handling of all plating wastes arising from finishing operations required in the manufacture of zippers. (Presented at 3rd Industrial Waste Conference, Purdue University, Lafayette, Ind., May 22, 1947.)

For additional annotations indexed in other sections, see: 27a-5.

15b — Ferrous

15b-1. Shattered Crankcase Salvaged by Welding. *Welding Engineer*, v. 33, Jan. 1948, p. 51.

Unusual repairs made on a 2-ton casting for a 300-hp. engine which restored a dredger to service.

15b-2. Welding and Flame Cutting. C. W. Brett. *Chemical Age*, v. 57, Dec. 6, 1947, p. 732-734.

Use of rapid repairs to help maintain production in the chemical industry.

15b-3. Los Angeles Program Speeds Reconditioning of Cast Iron Pipe. R. E. Hemborg. *Engineering News-Record*, v. 140, Jan. 8, 1948, p. 92.

The pipe is hand scraped, grit-blasted, mortar lined, and then coated with a coal-tar paint.

15b-4. Absorption Studies With Waste Pickle Liquor. J. Seiberlich. *Steel*, v. 122, Jan. 12, 1948, p. 90, 92, 97-98.

Activated charcoal appears to be the best selective absorption for ferrous sulphate in neutral and acid solutions. A method which lends itself to the problem of waste pickle-liquor disposal in steel and allied industries.

15d — Light Metals

15d-1. Scrapped Scrappers. *Industrial and Engineering Chemistry*, v. 40, Jan. 1948, p. 16A, 22A, 24A.

Methods and equipment used to recover metal from junked or wrecked planes in Germany during the war. Usual practice was use of a sloping hearth to which mixed scrap was fed and on which the lighter metals melted and were thus separated from the high melting-point materials. In one installation the molten metal was first washed with 25% molten Mg, forming insoluble, intermetallic compounds of Al or Mg with Fe, Mn, Si, Mo, Ti, Zr, and Ce, which were filtered or settled out. The filtrate was treated under vacuum with hydrogen, which distilled out the Mg along with Zn, Cd, Pb, Ca, Bi, Ba, and Sb.

(Turn to page 26)

Large Locomotives Pose Metallurgical Problems in Boiler, Firebox Materials

Reported by T. E. Norman
Metallurgical Engineer
Climax Molybdenum Co.

Many metallurgical problems have developed as a result of the trend in railroading toward larger locomotives, higher speeds and greater factors of safety, Ray McBrian, engineer of standards and research for the Denver and Rio Grande Western Railroad, told a recent meeting of the Rocky Mountain Chapter. Much of this development has grown like Topsy, and it is only within the past few years that the metallurgist has been called upon to play an important part in it.

In 1882, Mr. McBrian's company was using 129,000-lb. locomotives, which generated steam at a maximum pressure of 160 psi. Today the latest (1941 model) 3700 class steam locomotives weigh over a million pounds and generate steam at 275 psi. Many metallurgical problems have developed on these larger sizes of steam locomotives.

The boiler and firebox materials on a locomotive are subjected to severe treatments not normally encountered in stationary steam power plants. The frequent cycles of heating and cooling introduce a number of specialized problems such as the aging of boiler steels, causing intergranular cracks. Stresses developed during the heating cycles, together with vibration stresses, may also cause the transcrystalline fatigue cracks.

The only nonaging steel so far discovered contains substantial amounts of columbium. This is too expensive for most locomotive boilers, but the influence of columbium may offer clues regarding the phenomena which cause aging. Electron photomicrographs, Mr. McBrian said, indicate that aging may be partially caused by precipitation in the grain boundaries of some constituent, which might be a carbide, nitride, or oxide. This precipitation occurs during repeated heating and cooling through the blue brittle range. A firebox steel containing 0.5% molybdenum has given good results at temperatures in excess of 1000° F. on the fire side.

Discussing problems on railroad rails and joint bars, Mr. McBrian pointed out that decarburized surface is the origin of many failures in rails. The transverse fissure problem has been largely eliminated by controlled cooling of the rails after rolling. Head checks, caused by plastic deformation of the rail head, have been a serious problem in mountain railroading. Attempts to correct this by increasing the manganese content of the rails introduced the problem of temper brittleness, which caused some of the rails to crack without warning during cold weather.

Mr. McBrian placed great emphasis on decarburization as a culprit responsible for many failures. Its influence has been evident in rails and joint bars, in wrought steel wheels and tires, and in plate materials such as boiler and firebox steels. In many of these materials, it is not practicable to remove the decarburization by machining or grinding. One of the best alternatives appears to be to strengthen the decarburized skin by the use of ferrite-strengthening alloying elements in the steel.

Work being done at the D. & R. G. laboratory on the prevention of failures by use of spectrographic analysis represents a recent development of considerable interest. Such analyses, when run on the ash from crankcase oils, have been very effective in indicating corrosion and wear in bus engines and locomotive diesel engines. The trouble is detected in its early stages when preventive measures can be taken.

Hugo Johnson Appointed To Battelle Institute Staff

Hugo E. Johnson, formerly research associate with the Carnegie-Illinois Steel Corp., has been appointed to the administrative staff of Battelle Institute, Columbus, Ohio. Mr. Johnson will coordinate the interests of the various research groups at Battelle concerned with the metallurgy of iron and steel and act in a liaison capacity between the Institute and the iron and steel industries.

Hugo Johnson

Mr. Johnson is a graduate in metallurgical engineering from Ohio State University, and has previously been associated with the Youngstown Sheet and Tube Co., Carnegie Steel Co., Battelle Institute, and for the past seven years with the research and development division of Carnegie-Illinois Steel Corp. in Pittsburgh. During his former service with Battelle, he was engaged as an engineer in metallurgical research.

New Members of A.S.M. Quarter-Century Club

Honorary certificates commemorating 25 years' consecutive membership in the American Society for Metals have been awarded to the following Boston Chapter members:

J. M. Darke, P. G. Fairbanks, C. F. Hawkridge, R. A. Johnston, H. H. Lester, F. H. Lovejoy, G. B. Waterhouse, R. S. Williams, and L. E. Zurbach Steel Co. (sustaining membership represented by William Brown).

Technical Papers Invited

The Publications Committee of the A.S.M. will now receive technical papers for consideration for publication in the 1949 *Transactions*. A cordial invitation is extended to all members and nonmembers of the A.S.M. to submit technical papers to the society. Many of the papers approved by the committee will be scheduled for presentation on the technical program of the 30th National Metal Congress and Exposition to be held in Philadelphia, Oct. 25 to 29, 1948. Papers that are selected for presentation at the Convention will be preprinted and manuscripts should be received at A.S.M. headquarters office not later than April 15, 1948.

Manuscripts in triplicate, plus one set of unmounted photographs and original tracings, should be sent to the attention of Ray T. Bayless, assistant secretary, American Society for Metals.

Headquarters should be notified of your intention to submit a paper, and helpful suggestions for the preparation of technical papers will be sent.

Educational Films on Nonferrous Metals Shown

Reported by C. H. Lloyd
E. F. Houghton & Co.

Despite zero weather about 85 men attended the first meeting of the West Michigan Chapter educational course on nonferrous metals held in Grand Rapids on Jan. 14. Some came from surrounding towns as far as 40 or 50 miles away.

The course consists of a number of films accompanied by explanatory talks. The movies presented on Jan. 14 were "The Story of Nickel" and "Men, Metals and Machines", supplied by International Nickel Co. The program was arranged for successive Wednesday evenings running through Feb. 25, as follows:

Jan. 21—"This Is Aluminum", "Drawing, Stretching and Stamping", and "Spinning"—three films supplied by Aluminum Co. of America.

Jan. 28—"Zinc and Die Casting", by courtesy of New Jersey Zinc Co.

Feb. 11—"Copper and Copper Alloy Products", a film covering sheet, rod, tubing, and extruded shapes, provided by Revere Copper and Brass, Inc.

Feb. 18—"Adventures in Research" and "A Nautical Trip by Radar", conducted by Westinghouse Electric Corp.

Feb. 25—"Magnesium" by Dow Chemical Co.

16

FURNACES and HEATING DEVICES

16a — General

16a-1. High-Temperature Equipment for Sintering Combinations of Ceramic Oxides and Metal Powders. A. R. Blackburn. *Engineering Experiment Station News* (Ohio State University), v. 19, Dec. 1947, p. 24-28.

Equipment designed for the above.

16a-2. Economics of Radio Frequency Heating. A. P. Bock. *Product Engineering*, v. 19, Jan. 1948, p. 118-121.

Three steps for determining whether or not the use of induction or dielectric heating is justified consist of preliminary analysis, technical analysis, and final economic analysis.

16a-3. Heat Losses in Furnace Linings. J. D. McCullough. *Industrial Gas*, v. 26, Jan. 1948, p. 7-11, 29-30.

Methods of determining the losses in furnaces because of heat stored in and conducted through furnace linings.

16a-4. A Discussion of Protective Atmospheres for Metallurgical Use. Charles E. Thomas. *Industrial Gas*, v. 26, Jan. 1948, p. 14-15, 25.

Presented before Midwest Industrial Gas Council, Chicago, Oct. 22, 1947.

16a-5. Drying. Samuel J. Friedman. *Industrial and Engineering Chemistry*, v. 40, Jan. 1948, p. 18-22.

Reviews 1947 literature on drying of miscellaneous materials including finishes, and equipment for the purpose. 163 ref.

For additional annotations indexed in other sections, see:
2a-2.

16b — Ferrous

16b-1. Producer-Gas. J. E. de Graaf. *Iron and Steel*, v. 20, Nov. 20, 1947, p. 566-569; discussion, p. 627-629.

Results of a Dutch investigation of the effects of variations in tar content, composition, and moisture content of producer gas on the performance of openhearths, as well as the relationship of these variations to the coal used. Frequent determination of tar and moisture content is feasible and worth while.

16b-2. Anthracite as Cupola Fuel. Part II. (Concluded.) C. C. Wright. *American Foundryman*, v. 12, Dec. 1947, p. 34-37.

Abstracted from *Transactions of the Fifth Annual Anthracite Conference of Lehigh University*, 1947, p. 123-154.

16b-3. Openhearth Design. Vincenzo Ferri. *Iron and Steel*, v. 20, Dec. 1947, p. 649-651, 657.

The Terni furnace was first studied and used in an Italian steelworks but was abandoned. More highly resistant refractories since developed and other simple modifications would eliminate the defects which caused abandonment. The essential feature of the furnace is the port design. The air ports gradually increase in cross section until they are as large as the hearth itself, thus practically eliminating turbulent flow in the furnace, which is said to result in increased output and reduced fuel consumption. (Condensed from *L'Ingegnere*, Sept. 1947.)

16b-4. Heating Rates in Electric Furnaces. G. B. Lamb. *Machinery (London)*, v. 71, Dec. 11, 1947, p. 661-663.

Experiments were made to determine the times required for heating mild steel bars to the center in a workshop furnace 10 in. in diameter by 20 in. deep. Heating curves are charted.

16b-5. Over de Haard van de Koepeloven. (The Hearths of Cupola Furnaces.) J. Derlage. *Metalen*, v. 2, Nov. 1947, p. 49-53.

Practical results with different types of cupola furnaces. Influences of various design factors.

For additional annotations indexed in other sections, see:
2b-7, 7c-6, 14d-1.

17

REFRACTORIES and FURNACE MATERIALS

17-1. The Development of Basic Insulating Bricks. J. H. Chesters, T. W. Howie, and T. R. Lynam. *Transactions of the British Ceramic Society*, v. 46, Nov. 1947, p. 349-370; discussion, p. 370-377.

Object of the work described was to produce a brick of high porosity suitable for the "all-basic" furnace roof, the advantages being lower initial cost, lower weight per brick, moderate insulating value, and reduced "bursting tendency" when chrome-magnesite batch is used. Four methods were used for obtaining porosity, namely: the addition of foam, combustible material, naphthalene, or of minerals such as raw magnesite which lose weight on firing.

17-2. Carbon—a Blast Furnace Refractory. M. T. Cory and F. B. Thacher. *Blast Furnace and Steel Plant*, v. 35, Dec. 1947, p. 1482-1487.

Properties of carbon refractories for use in the bottoms and linings of blast furnaces. A combination wall of carbon and fireclay brick is recommended over the all-carbon or ceramic hearth. Heat losses and temperature gradients in different types of walls are charted, and design details are diagrammed. (Presented at meeting of Refractories Division, American Ceramic Society, Bedford Springs, Oct. 10, 1947.)

For additional annotations indexed in other sections, see:
2a-2, 2b-5, 27a-12.

18

THERMAL TREATMENT

18a — General

18a-1. Heat Treating. *Steel*, v. 122, Jan. 5, 1948, p. 225-226, 228, 232-233.

Brief reviews of new developments: Induction Heating and Melting Out of Special Jobs Category, by R. N. Blakeslee; Convection Heating Used to Cut Annealing Period, by J. L. Whitten; Automatic Conveying Promotes Mass-Production Heat Treating, by Haig Solakian; Salt Bath Furnace Installed to Anneal Gear Blanks, by R. H. McCarroll; Hardenability Practical Aid in Productive Heat Treating, by A. Neudoerffer; Prepared Gas Atmospheres Widely Used in Heat Treating, by T. A. Frischman; Suspended Carburization Now Standard Procedure, by S. L. Widrig; Large Welded Structures Are Low-Temperature Stress Relieved, by T. W. Greene; Application of Salt Baths to Steel Treating Increased, by C. R. Foreman; Wrought High-Temperature Alloys Find Many Uses in Heat Treating, by E. V. Ivanso; Electric Heat Treating Units Make Gains During Past Year, by R. M. Cherry; Future Possibilities Seen for Homogeneous Carburization, by E. G. de Coriolis; Flame Hardening Increases Endurance Limits of Metals, by H. V. Inskeep; Refinements Continued in Furnace Atmosphere Controls, by Willard Roth; Important Strides Made in Induction Heating Practices, by T. H. Gray; Scope of Electric Heat Treatment Is Broadened, by John P. Zur; Full Meaning of Carbo-Nitriding Not Yet Completely Realized, by W. H. Holcroft; Increased Use of Induction Heating for Forging Predicted, by W. E. Benninghoff; Improved Processing Methods Vital to Metal Industries, by Frederic O. Hess; Development Serves to Perfect Liquid Carburizing Baths, by D. J. Richards.

18b — Ferrous

18b-1. Sulphide Penetration in the Carburization of Steel. A. Preece and K. J. Irvine. *Journal of the Iron and Steel Institute*, v. 157, Nov. 1947, p. 336-343.

Mechanism demonstrated by experiments in which suitably coated specimens of Armco iron were exposed to carburizing mixtures of CO and CO_2. By adjusting the gas mixture, deep-seated inclusions of iron sulphide were converted into iron oxide, and also into manganese sulphide by prolonged treatment at 1000° C. Results also showed interrelated effects between carbon, sulphur, and oxygen which may be of significance in the segregation and homogenization of steel castings.

18b-2. Anisothermal Formation of Bainite and Pro-Eutectoid Constituents in Steels. Leonard D. Jaffe. *Metals Technology*, v. 14, Dec. 1947, T.P. 2290, 14 pages.

Principles that govern the relations between isothermal and anisothermal decomposition of austenite. The effect of holding austenite at one temperature upon its subsequent decomposition at another temperature below the stability range of the austenite was studied. 12 ref.

18b-3. Induction Heating Triples Die Life. J. M. Butler. *Steel*, v. 122, Jan. 19, 1948, p. 98, 100.

For additional annotations indexed in other sections, see:
19b-5, 20b-6, 22b-15, 27b-3, 19d-2.

18c — Nonferrous

18c-1. Continuous Annealing Nonferrous Strip. E. S. Kopecki. *Iron Age*, v. 161, Jan. 8, 1948, p. 46-50.

Use of the controlled-atmosphere, vertical strip annealing furnace permits close control over the surface quality and metallurgical characteristics of many types of nonferrous metals and alloys. Use of an electrical heat source enhances control over temperature conditions, while the "vertical" feature offers substantial savings in floor space.

19

WORKING

19a — General

19a-1. Back-Pull Wire Drawing; A Critical Review of Literature. J. G. Wistreich. *Journal of the Iron and Steel Institute*, v. 157, Nov. 1947, p. 417-428.

The salient features of drawing with back pull; basis for further research. 14 ref.

19a-2. The Light-Section Mill at the Darlington Works of the Darlington and Simpson Rolling Mills, Ltd. *Journal of*

(Turn to page 28)

Seven Factors Determine Extent Of Corrosion

Reported by Louis Malpoker

Lincoln Engineering Co.

The fundamental reaction in corrosion involves a transfer of electrons in which some positively charged ions in the corroding solution (usually hydrogen ions) lose electrical charges which are acquired by the metal or alloy being corroded. With this explanation H. O. Teeple of International Nickel Co., Inc., opened his talk on corrosion behavior of high-nickel alloys and stainless steels before the St. Louis Chapter.

According to Mr. Teeple, there are seven important factors that determine the extent or progress of corrosion.

First of these factors is the acidity of the solution. Acid (low pH) solutions are, as a rule, more corrosive than neutral (pH = 7) or alkaline (high pH) solutions.

Mr. Teeple named oxidizing power of a solution as the second factor speeding up corrosion. As an example of this effect, corrosion rate of monel in 5% sulphuric acid at 30° C. changes from 40 mdd. in unaerated acid to 240 mdd. if air is introduced into the acid. Oxidizing agents may retard corrosion, such as in 18-8 stainless steels, since the introduction of air in a dilute sulphuric acid solution reduces the corrosion rate from 300 mdd. to 2 mdd., the former occurring in an air-free solution.

An increase in temperature also generally tends to increase the rate of corrosion. However, if all the air is boiled out of a dilute sulphuric acid solution, the rate of corrosion of monel will decrease, while the corrosion rate of a stainless steel may increase because of the loss of the oxidizing substance needed to maintain its protective film.

The fourth factor is velocity; an increase in velocity in some instances increases corrosion by removing protective films or by increasing the dissolving power of the corrosive. Effect of protective films is another factor, although high-nickel alloys do not necessarily depend on these films for their resistance to corrosion. Inhibitors are occasionally used to control corrosion.

Effect of concentration cells was the seventh factor considered. Two types of concentration cells were shown and explained—the metal-ion concentration cell and oxygen concentration cell. In the first type, if conditions are such that the concentration of metal ions in a solution at one point on a metallic surface is appreciably different from the concentration of the metal ions at another point, the resulting difference in potential will cause an electric current to flow between the two points. The direction of this current flow will be from the metal to the solution at the point where the metal-ion concentration is low, and from the solution to the metal at the point where the metal-ion concentration is high.

Mr. Teeple then mentioned five minor factors which affect corrosion—namely, surface conditions, effect of stress, heat treatment, welding and galvanic relationships.

During the discussion slides were shown to illustrate the above factors and their influence on the high-nickel alloys (which, in general, depend upon their inherent insolubilities in various corrosive mediums) and on the stainless steels (which, in general, depend upon the formation and maintenance of a passive film).

Tocco Purchases Budd Div.

Purchase of the Induction Heating Division of the Budd Co., Detroit, by the Ohio Crankshaft Co. of Cleveland for its Tocco Division has been jointly announced by Edward G. Budd, Jr., and W. C. Dunn, respective presidents of the two companies. The purchase includes machinery, equipment, inventories, and patents but not the land or the buildings.

The future line of induction heat treating machines and products to be sold by the Tocco Division of Ohio Crankshaft will embody the best designs of the machines formerly sold by both Budd and Tocco.

the Iron and Steel Institute, v. 157, Nov. 1947, p. 447-452.

Plant is intended for production of standard window-frame sections and similar small shapes.

19a-3. Lubrication in Drawing Operations. E. A. Evans, H. Silman, and H. W. Swift. *Engineering*, v. 164, Nov. 14, 1947, p. 477-479.

Previously abstracted from *Sheet Metal Industries*. See 21-99 and 21-107, R.M.L., v. 4, 1947 *(Metals Review*, Dec. 1947). For first installment in *Engineering*, see 21-109, R.M.L., v. 4, 1947 (*Metals Review*, Jan. 1948).

19a-4. A Correspondent Examines Wire Liming. Suggestions for Improvement. *Wire Industry*, v. 14, Dec. 1947, p. 688.

The lime coat on rods and wire has three purposes: neutralizing acid remaining on the material after washing; sealing the undercoat; and acting as a lubricant carrier during the drawing operation. Limitations, mode of application, use of glycerine, and use of other compounds.

19a-5. Forging and Forming. *Steel*, v. 122, Jan. 5, 1948, p. 198, 200.

Brief reviews of new developments: Wider Use of Die Forgings Decreases Product Costs, by Waldemar Naujoks; User's Press Problems Studied to Gain More Hourly Output, by R. E. Dillon; Larger, Faster Equipment Built by Press Industry, by John F. Herkenhoff; New Tools Boost Expansion of Sheet Metalworking Plants, by J. T. Dillon, Jr.; Holds Stamping Answer to Low-Cost Mass Production, by Sam Morrison; Heat Resistant Stainless Alloys Forged Succesfully, by C. H. Smith, Jr.; Erection of Record Size Tanks Creates Added Welding Problems, by Fred L. Plummer; Stamping Industry to Feel Steel Shortage Until Late 1948, by Tom J. Smith, Jr.; Forging Developments to Benefit Many Manufacturers, by R. H. Jones.

19a-6. Forging the Stainless Metals. Waldemar Naujoks. *Steel Processing*, v. 33, Dec. 1947, p. 735-737.

The four general types of stainless forging metals; forging techniques; forging design; selection factors.

19a-7. Automatic Transfer Method for Stamping Parts at High Rate. *Automotive Industries*, v. 98, Jan. 15, 1948, p. 27.

Method developed by AC Spark Plug Div., General Motors Corp.

19a-8. Hand Curling and Bending Tool. J. C. Murgatroyd. *Machinery* (London), v. 71, Dec. 18, 1947, p. 705.

Home-made tool.

19a-9. Dies for Forming Metal Along Natural Flow Lines. *Machinery* (London), v. 71, Dec. 25, 1947, p. 715-718.

New design technique known as "Sol-A-Die" and its application to the forming of unusual shapes, such as used in aircraft exhaust manifolds.

19a-10. Wire Mill Practice No. 2. Principles of Wiredrawing. W. F. G. Kerley. *Wire Industry*, v. 14, Dec. 1947, p. 683-684.

Some practical examples. (To be continued.)

For additional annotations indexed in other sections, see: 11-6, 24a-3, 25a-15.

19b — Ferrous

19b-1. Torrington Four-Row Roll Neck Bearings. Part III. Maintenance. *Bearing Engineer*, v. 7, Nov-Dec. 1947, p. 5.

Selection, application, and maintenance of four-row tapered roller bearings for steel mill service. (Concluded.)

19b-2. Rules for Upsetting Bar Stock. *American Machinist*, v. 92, Jan. 1, 1948, p. 123.

Rules, formulas, and diagrams.

19b-3. Rules for Upsetting Tubing. *American Machinist*, v. 92, Jan. 1, 1948, p. 125.

Rules, formulas, and diagrams.

19b-4. New Canadian Continuous Strip Mill. F. J. Erroll. *British Steelmaker*, v. 13, Dec. 1947, p. 612-613.

Operation of the 56-in. continuous hot-strip mill in the Hamilton works of Steel Co. of Canada.

19b-5. The Stainless Steels—Fabrication and Heat Treatment After Cold Working. Part III-A. Lester F. Spencer. *Steel Processing*, v. 33, Dec. 1947, p. 755-760.

Spinning and annealing pretreatments; cold heading; the pickling of austenitic compositions, including pickling solutions and equipment used in pickling. (To be continued.)

19b-6. Pressures to Pierce Sheet Steel. E. V. Sargeant. *American Machinist*, v. 92, Jan. 1, 1948, p. 139, 141.

Two charts of piercing pressure vs. hole size for various thicknesses.

19b-7. Press Forging. *Automobile Engineer*, v. 37, Dec. 1947, p. 493-497.

Advantages to be gained through use of press forging; some actual automobile applications.

19b-8. Die Material Changeover Increases Bearing Output Tenfold. *Steel*, v. 122, Jan. 12, 1948, p. 98.

Results of installation of carbide cut-out and cupping dies in a nine-stage progressive die set.

19b-9. Test Cases Prove Shot-Peening Merit. *SAE Journal*, v. 56, Jan. 1948, p. 65. Based on "Shot-Peening", by Fred K. Landecker.

Charts show value as determined on various tractor and truck parts. (To be printed in full in *SAE Quarterly Transactions*. Presented at S.A.E. National West Coast Transportation & Maintenance Meeting, Los Angeles, Aug. 21, 1947.)

19b-10. Drawing Auto Engine Rocker-Arm Covers. T. E. Lloyd. *Iron Age*, v. 161, Jan. 15, 1948, p. 84-86.

Mainly because of inconsistent thicknesses in purchased sheet steel, Buick has shifted from mechanical to hydraulic presses in deep drawing of rocker-arm covers for its engine. Scrap losses and reworking have been reduced to such an extent that it is now planned to produce oil pans in the same manner.

19b-11. Induction Heating for Forging Operations. J. M. Butler. *Machinery*, v. 54, Jan. 1948, p. 156-157.

Use in forge division, Willys Overland Motors.

19b-12. Drawing Thin-Walled Shells of Intricate Shape. Donald A. Baker. *Machinery*, v. 54, Jan. 1948, p. 171-175.

Series of steps required for production of a thin-walled radio tube part that presents three types of drawing problems—drawing the inside boss, drawing the main shell, and expanding the boss. Includes a final machining operation.

19b-13. Bending a Textile Mill Forging in an Arbor Press. Robert Mawson. *Machinery*, v. 54, Jan. 1948, p. 190-191.

19b-14. Pilger Mills; a General Review of the German Steel Tube Industry. J. C. Eck and A. E. V. Sparrow. *Iron and Steel*, v. 20, Dec. 1947, p. 669-672.

Based on B.I.O.S. Report No. 3187. (To be concluded.)

19b-15. Modern Small Rolling Mills. G. A. Phipps. *Blast Furnace and Steel Plant*, v. 35, Dec. 1947, p. 1498-1501, 1510, 1512-1513.

Five small high-production mills of American design built and installed in Great Britain during 1932-1939. Two were for the production of rods, one for strip, one for bar and strip, and the other for sections, bar, and strip. (Presented before British Iron and Steel Institute. To be continued.)

For additional annotations indexed in other sections, see: 24b-1, 3c-3, 24b-5.

19c — Nonferrous

19c-1. Molybdenum and Tungsten Wire Drawing. *Industrial Diamond Review*, v. 7, Nov. 1947, p. 329-331. Based on B.I.O.S. Final Report No. 684, Item No. 21, "Production of Molybdenum and Tungsten for Radio Valves and Electric Lamps, Metallworker Plansee, Reutte, Tyrol."

19c-2. Production of Instrument Wires in Germany. *Industrial Diamond Review*, v. 7, Nov. 1947, p. 344. Based on B.I.O.S. Final Report No. 1357, Item No. 9.

19c-3. Structure d'Emboutissage des Metaux Usuels. (Structure Resulting From Stamping of Ordinary Metals.) Part I. J. Tennevin and R. Michaud. *Métaux et Corrosion*, v. 22, July 1947, p. 109-119.

The structures of sheets of various types of aluminum and brass, both before and after stamping, were studied using X-ray diffraction. The nature of the deformation upon stamping. 28 ref. (To be continued.)

19c-4. The Hydraulic Extrusion Press in the Light of Latest Developments and Its Scope in Nonferrous Metal Production. Joseph Bronner. *Machinery Lloyd* (Overseas Edition), v. 19, Dec. 20, 1947, p. 68-71.

Practical principles of operation; extrusion properties of common metals and alloys; typical applications.

19d — Light Metals

19d-1. Spinning and Panel-Beating of Aluminum Alloys. Part II. E. R. Yarham. *Modern Machine Shop*, v. 20, Jan. 1948, p. 138-140, 142, 144, 146, 148, 150, 152, 154, 156, 158, 160.

The technique employed in spinning aluminum alloys in Britain. (To be continued.)

19d-2. Aluminum Sheet. *Automobile Engineer*, v. 37, Dec. 1947, p. 497.

Production factors affecting grain size including influence of hot working and of annealing the slabs.

19d-3. Shot-Peening Aluminum Forgings. *Machinery* (London), v. 71, Dec. 11, 1947, p. 651-656.

Methods and equipment used at Pratt & Whitney Aircraft Division, East Hartford, Conn.

19d-4. Bending and Forming of 75S-T Aluminum at Elevated Temperatures. M. L. Ochieano. *Machinery*, v. 54, Jan. 1948, p. 158-161.

Use of resistance heating process in bending and forming aluminum alloys, which has increased formability in many instances more than 150%.

19d-5. The Mechanical Working of Magnesium Sheets. R. Groves. *Machinery Lloyd* (Overseas Edition), v. 19, Dec. 20, 1947, p. 88-92.

Recommended procedures, including die design.

20

MACHINING and MACHINABILITY

20a — General

20a-1. Feet for Jigs and Fixtures. W. H. Litten. *Machinery* (London), v. 71, Nov. 13, 1947, p. 545-546.

Examples of stable and unstable designs.

20a-2. An Interlock Guard for Milling Machines. *Engineer*, v. 184, Nov. 14, 1947, p. 461.

20a-3. Auto-Collimator and Its Applications. *Machinery* (London), v. 71, Nov. 20, 1947, p. 568-570.

Instrument designed to measure small angular deflections to a fraction of a second of arc and its applications in machine-shop practice.

20a-4. Mechanism for Stopping Press

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Steel Quality Identified With Use or Product

Reported by J. J. Preisler
Standards Engineer, Metallurgical
Sperry Gyroscope Co.

The identification of steel quality with use or product description was strongly emphasized by Charles M. Parker of the American Iron and Steel Institute at the New York Chapter meeting on Dec. 8. Mr. Parker, speaking on "The Metallurgy of Quality Steels", presented a definitive discussion of the all-too-loosely applied terms: kind, type, grade, and quality of steel.

After disposing of the misconception that steel quality may be described in terms of steelmaking processes, Mr. Parker gave a brief history of the development of steel specification practices. The fundamental weaknesses of specifying by chemical composition alone were elaborated upon, and the shortcomings of the mechanical property specification, hardenability specification and the formal specification (A.S.T.M. and others) were indicated.

The variables in steel manufacture that affect quality and which are not set forth in specifications, such as selection of raw materials for melting, refining period, lime charge, deoxidation practice, ingot and slab preparation, rolling and reheating procedure, are, according to Mr. Parker, grounded in experience and skill and are best left to the judgment and integrity of the steelmaker. However, several features of steel quality should be understood by the consumer in order to allow intelligent discussion of his problems with the steel producer. The relationship of killed, semikilled, capped, and rimmed steels to degree of chemical segregation, nature of pipe, variation in mechanical properties, and other phenomena, is of direct bearing on the suitability of a steel for a given application.

Another important aspect of consumer-producer relationship with regard to steel quality is presence of defects. Here again, emphasis was placed on end use requirements when considering inclusions, decarburization, blowholes, cracks, seams, scabs, pipe, flakes, rolled-in scale, and other deviations from the fictitious "ideal" steel.

While Mr. Parker's comments regarding specifications are somewhat controversial, there is certainly universal agreement that a better understanding of the nature of steel quality will allow a more equitable basis for discussion between the steel user and steelmaker.

Company Name Changed to Heli-Coil

The name of the Aircraft Screw Products Co., Inc., Long Island City, N. Y., has been changed to Heli-Coil Corp., according to Alfred Marchev, president of the company.

Wiredrawing Progress Made in Tolerances, Speeds and Reduction

Reported by W. S. Beecher
Chief Metallurgist, Indian Motocycle Co.

The first record of wire made in the United States was about 1800, when wrought iron bars were forged to ¼ in. diameter, drawn through dies to a finer size and wound on blocks, according to Rodman R. Tatnall, metallurgical engineer for the Wickwire Spencer Steel Corp. Wire forming as an industry in this country developed during the war years when wire could no longer be imported, the speaker continued, addressing the November meeting of the Springfield Chapter. As the wire industry has developed, the raw materials, machinery, properties of the wire and the material in the die all have changed but the principle of the die is still the same as when first devised.

Wire today can be held to a tolerance of 0.001 in. and less on the diameter by using carbide inserts in the conical portions of the die. Drawing speeds of up to 1200 ft. per min. are possible.

The raw material for steel wire comes from the hot mills in diameters of ¼ to 1 in. and in long coils weighing several hundred pounds. A reduction in cross-sectional area of 30 to 35% is the maximum that can be made in a single draft; however, with successive drafts a total reduction of 80 to 85% is possible. With steel of proper analysis and with sufficient drawing and proper heat treatment, tensile strength up to 400,000 psi. has been attained.

Carbon content is decisive in determining maximum tensile strength, as shown by the following ranges: carbon under 0.15%, tensile strength up to 100,000 psi.; carbon 0.60%, tensile strength up to 200,000 psi.; carbon 0.90%, tensile strength 400,000 psi.

The production of steel wire for 1946 amounted to 2,000,000 tons.

New Openhearth at Site Of First U.S. Basic Furnace

In line with its general program of postwar reconversion and expansion the Jones & Laughlin Steel Corp. is adding to the capacity of its Otis Works. Included in this program is a new basic openhearth furnace designed to furnish additional steelmaking capacity for the company's strip mills.

The first basic openhearth furnace in the United States was installed at the Otis Works in 1886 in a part of the works now dismantled. Jones & Laughlin's new furnace will have a rated capacity of 175 net tons, and is being engineered and constructed by Loftus Engineering Corp.

When Stock Feed Fails. *Machinery* (London), v. 71, Nov. 20, 1947, p. 571-572.

20a-5. Automatic Hydraulic Knurling Fixture. *Machinery* (London), v. 71, Nov. 27, 1947, p. 598-599.

Shafts with diameters from ½ up to 1 in. can be knurled at the rate of 510 per hr. by means of the unit illustrated.

20a-6. Adjustable Boring Fixture for Machining Fillets to Different Radii. *Machinery* (London), v. 71, Nov. 27, 1947, p. 599.

Smoothly finished fillets or corners can be turned to different radii on the outer or inner diameters of cylindrical parts by means of the fixtures described.

20a-7. The Production of Small Worm Gears for Experimental Work. A. M. Gunner. *Institution of Mechanical Engineers Proceedings*, v. 156, Dec. 1947, p. 368-372.

Methods used for production of one or two each of an endless variety of worm gears for use in a research laboratory. The gears are designed as hollow-faced helical gears, and all calculations are based on the normal pitch in order to enable standard hobs and cutters to be used for the worms.

20a-8. Manufacture of Diamond Tools and Their Application in Germany. *Industrial Diamond Review*, v. 7, Nov. 1947, p. 334-342. Reprinted from B.I.O.S. Report No. 1448, "The German Industrial Diamond Industry", by G. J. Trapp and others.

31 references. (To be continued.)

20a-9. A Handbook of Vertical Surface-Broaching Fixtures. Part I. Ben C. Brosheer. *American Machinist*, v. 92, Jan. 1, 1948, p. 77-92.

Stationary, trunnion, index, and universal fixtures. (To be continued.)

20a-10. Practical Ideas. *American Machinist*, v. 92, Jan. 1, 1948, p. 103-108.

Use of holders for toolmaker's buttons to solve difficult layout problems (Frederico Strasser); air cylinder for automatic tandem loading of presses (Joseph F. Budnick); open-side toolholders for close facing and turning (Arthur Morton); rubber jaws for holding several pieces of round stock at the same time (A. F. Scoblic); telescoping vise insert to hold sheet metal flat while polishing or filing (C. D. Mackinnon); use of indexing table to mill 6-hex heads in three passes (Robert Mawson); and other miscellaneous shop hints.

20a-11. Cams—Their Production and Application. John E. Hyler. *Machine and Tool Blue Book*, v. 44, Jan. 1948, p. 131-136, 138-139.

First of a series. (To be continued.)

20a-12. Accurate Machining of External and Internal Straight-Sided Splines. Douglas T. Hamilton. *Machine and Tool Blue Book*, v. 44, Jan. 1948, p. 149-152, 154-155.

A forming process can be used to produce straight-side splines without leaving a fillet at the bottom of the spline. Equipment necessary and method of application. Types of cutters used for external splines; methods of aligning cutter with the work.

20a-13. Work Clamps, Supports and Fastenings for Use With Drill Jigs. C. W. Hinman. *Machine and Tool Blue Book*, v. 44, Jan. 1948, p. 168, 170, 172, 174, 176, 178, 180, 182, 184.

Some of the fastening devices used with drill jigs.

20a-14. Machining. *Steel*, v. 122, Jan. 5, 1948, p. 287-317.

Brief reports on various new developments: Ingenuity of Machine Tool Builders Revealed at Show, by George H. Johnson; Push-Button Control Makes for High Quality Workmanship, by Louis Polk; Predicts Era of Technical Changes in Manufacturing, by Frederick V. Geier; Carbide Tool Design Aided by Mechanical Holder, by Philip M. McKenna; Trend to Reduced Handling Time Instead of Reduced Speed, by Charles J. Stilwell; Good Housekeeping, Efficiency Aim of New Machine Designs, by F. J. Lapointe; Sees End of Rule-of-Thumb Machine Tool Design Methods, by R. J. Johnson; Carbides Not Limited to Nonpercussive Applications, by W. G. Robbins; Trend Toward Greater Use of Carbide Tools Noted, by R. R. Weddell; Mechanical Hob Shift Promotes Precision in Hobbing Techniques, by Ralph L. Cotta; Idle Time Must Be Studied to Achieve Cost Reduction, by O. L. Bard; First Postwar Advancement in Over-All Design Noted, by H. B. Newton; Newly Designed Lathes Powered for Carbides, by W. J. Grimm; Automatic Equipment Points Way to Reduced Labor Costs, by J. G. Johnston; Modern Machinery Urgent Economic Necessity, by J. Y. Scott; Circuit Breakers Provide Manual Disconnect on Machine Tools, by L. W. Herchenroeder; Machine Tool Users More Speed-Conscious Than Ever Before, by William L. Dolle; 1947 Seen as Outstanding Year in Art of Cutting Metal, by A. C. Bryant; Diesetting Now Easy as Cranking Table of Miller, by R. F. Moore; Improvements in Hydraulic Systems Provide Longer Service, by Silas T. Massey; Multiple Spindle Automatics Permit Less Work Handling, by H. P. Chaplin; Largest Diameter Brass Rod Available for Fabricators, by M. J. Mianulli; Rising Costs Demand Better Processing and Handling, by J. R. Weaver; Carbides Speed, Increase Accuracy of Many Machines, by C. R. Harmon; Definite Trend to Automatic Sizing and Truing Sensed, by C. D. Day; Sees Increased Demand for New Broaching Equipment, by Harry Gotberg; Tools Must Be Designed Right, Made Right for Specific Use, by S. B. Hellstrom; Further Gains in Automaticity Seen Through Use of Electronics, by E. P. Blanchard; New Machines Different From Prewar Prototypes, by Tell Berna; Trend to Single-Station Units Served by Automatic Loading, by W. S. Praeg; "Customer Education" Important in Proper Use of Carbides, by K. R. Beardslee; Tool Engineer Seen as Industrial Statesman, by Harry E. Conrad; Careful Analysis Required in Selecting Presses, by George Habicht, Jr.; Better Equipment, Sales Methods Twin Keys to Inflation Problem, by Frederick S. Blackall, Jr.; Tool Engineer Must Guide Progress of Productivity, by Otto W. Winter; Lowering of Operating Costs to Require Bold Top Decisions, by K. W. Connor; Improved Machine Tool Design Offers Increased Production, by J. K. Fulks; Machine Tool Industry Is Not Designing Self Out of Business, by B. N. Brockman; Tracer-Controlled Cutting Tool Aids Templet Work Duplication, by Alfred Kullman; Sees Automatic Equipment Opening New Industrial Era, by E. E. Butler.

20a-15. Truing Profiled Grinding Wheels. P. Grodzinski. *Machinery* (London), v. 71, Dec. 4, 1947, p. 624-627.

Analyzes mathematically the method using a universal diamond truing device. Other possible methods.

20a-16. Tool Geometry of Face Milling Cutters. M. Kronenberg. *Machinery* (London), v. 71, Dec. 4, 1947, p. 628-630.

To facilitate demonstration and study of the problems involved the Cincinnati Milling Machine Co. prepared a transparent plastic model of a typical face-milling cutter. Three different aspects are illustrated: angular relationships, chip flow, and initial contact of tooth and workpiece. Chart for determining true rake and inclination of face-milling cutter teeth.

20a-17. Machine Vise Adapter for Angular Workpieces. *Machinery* (London), v. 71, Dec. 4, 1947, p. 632-633.

20a-18. A Vertical Indexing Chucking Fixture. *Machinery* (London), v. 71, Dec. 4, 1947, p. 633.

20a-19. C. P. Shops Are Completely Equipped. Howard Campbell. *Modern Machine Shop*, v. 20, Jan. 1948, p. 124-130, 132, 134, 136.

Shop equipment for maintenance of rolling stock of the Canadian Pacific Railway at Montreal.

20a-20. Ideas From Readers. *Modern Machine Shop*, v. 20, Jan. 1948, p. 200, 202, 204, 206, 208, 210, 212, 214, 216.

A Useful Drilling Jig for Uneven Workpieces, by Robert Mawson; Blocked-Up Press Column Provides More Space for Drilling Operations, by Walter Rudolph; Device for Centering Milling Machine Cutters, by D. E. McDonald; Tool Post Wire Guide, by Bert Charlesworth.

20a-21. Gear Cutting Equipment Found Applicable for Uses Outside Its Original Field. *Steel*, v. 122, Jan. 12, 1948, p. 86, 89.

Many uses outside the gear field include splines, cams, sprockets, ratchets, toothed parts, sliding clutches, and special forms. A few typical parts are diagrammed along with the tool shapes used to cut them.

20a-22. Wandering Sequence Control for Multiple-Spindle Honing Machine. J. E. Kline. *Electrical Manufacturing*, v. 41, Jan. 1948, p. 116-119, 182.

Measured acceleration, deceleration, and inertia of the rotor are used to calculate the torque developed.

20a-23. Align Honing Eliminates Bearing Scraping. H. E. Linsley. *American Machinist*, v. 92, Jan. 15, 1948, p. 88-89.

Recent development known as align honing makes possible finish honing of two bearings in line to extremely close limits of size, roundness, taper, and alignment.

20a-24. Tool Angles Govern Cutting Efficiency. M. Kronenberg. *American Machinist*, v. 92, Jan. 15, 1948, p. 90-92.

Previously abstracted from *Machinery* (London). See item 20a-16.

20a-25. A Handbook of Vertical Surface-Broaching Fixtures. Part II. Ben C. Brosheer. *American Machinist*, v. 92, Jan. 15, 1948, p. 101-116.

Various types of shuttle fixtures: those with hand-operated clamps; with mechanical clamps; and with air and hydraulic clamps. (See also 20a-9.)

20a-26. Practical Ideas. *American Machinist*, v. 92, Jan. 1, 1948, p. 119-124.

Spherical-turning lathe tool for cutting precision ball-and-socket elements (Allen B. Nixon); indicator for setting rough and finished shaft diameters (T. H. Hanley); steel balls as centers to improve offset tailstock taper turning (A. F. Wyleta); special gages for counterbore-to-end distance, pilot depth, and simultaneous gaging of hole depth and neck length (F. Hartley); centering device to locate keyways on tapered shafts (W. M. Halliday); and other miscellaneous shop hints.

20a-27. Automatic Milling Machine Guard. *Machinery* (London), v. 71, Dec. 11, 1947, p. 663.

Guard designed and patented in England is shown attached to a Cincinnati Milling machine.

20a-28. Manufacture of Diamond Tools and Their Application in Germany. (Continued.) *Industrial Diamond Review*, v. 7, Dec. 1947, p. 354-363.

Application of truing tools; glass cutters; stone sawing and rock drilling; and diamond drawing dies. 15 ref. (To be continued.)

20a-29. The Basic Principles of Grinding Hard Materials. (Continued.) Ph. Kruel. *Industrial Diamond Review*, v. 7, Dec. 1947, p. 367-371. Translated from "Grundlogende Erkentnisse Veber das Schleifen

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J. C. Fox at Detroit Meeting

Shown at the November Meeting of the Detroit Chapter ⊕ (Reported in Last Month's Issue) Are (Left to Right): Technical Chairman Joseph Gurski of Ford Motor Co.; Chapter Chairman E. H. Stilwill of Dodge Division; and J. C. Fox of Doehler-Jarvis Corp., Who Spoke on Die Castings

Cast Iron Handbook Data Supplemented

Reported by Richard L. Priess
Southern Power & Industry

Utilizing an extensive set of diagrams, conventional and three-dimensional photomicrographs, and interesting clay models of the familiar elongated graphite flake structure, James T. MacKenzie, technical director of the American Cast Iron Pipe Co., supplemented the average metallurgical handbook information on the engineering properties of cast irons before the January meeting of the North Texas Chapter ⊕.

A discussion of the basic metallurgy and structure of various types of cast iron was followed by a thorough discourse on the numerous variations in composition and foundry practice, which result in a wide range of physical properties. A good portion of the research was conducted by the American Cast Iron Pipe Co., but work of the National Bureau of Standards, International Nickel, and the British Cast Iron Research Association was specifically noted.

Dallas and Fort Worth metallurgical engineers were particularly interested in Dr. MacKenzie's discussion of the chill characteristics of specific gray cast iron types and how they can be utilized as a control in foundries working to close physical and chemical tolerances. How ladle inoculation, a local enrichment effect, results in a fine, evenly distributed graphitic flake structure, was emphasized.

Dr. MacKenzie also noted the desirable properties for general engineering and industrial applications.

Following the technical presentation, an informal discussion period offered considerable latitude, covering centrifugal casting methods, corrosive soil conditions in various locations in the South and Southwest, and interesting case histories on the service life of cast iron pipe. Further details of Dr. MacKenzie's talk will be found in the report of the Texas Chapter meeting on page 37.

Jap Journals Acquired

Several hundred paper-bound journals, representing a major portion of the issues of 12 Japanese scientific research publications which appeared during the war, have been received at Carnegie Institute of Technology, and are now being catalogued. All of the material will be available on loan to scientists and students upon request. About one-half is printed in Japanese, the remainder in English.

Obtained at the request of Carnegie's Metals Research Laboratory, the Japanese journals contain reports of valuable work in metallurgy, according to Frederick N. Rhines ⊕, associate professor of metallurgy at Carnegie Institute of Technology.

von Hartstoffen, Heft 3—Forschugnsarbeiten aus dem Gebiet Schleifen und Polieren".

Metallic wheel bodies with pressed-in diamond grains; influence of amount of lubrication; grinding of sintered carbides. Appendix on determination of optimum grain size for minimum working time.

20a-30. Diamond Wheels, Their Manufacture and Use. T. D. Meyer. *Industrial Diamond Review,* v. 7, Dec. 1947, p. 372-374. Condensed from *Australasian Engineer,* Jan. 7, 1947, p. 52-56.

20a-31. Safety Attachment for Power Saws. Reginald J. Gilson. *Machinery,* v. 54, Jan. 1948, p. 154.

20a-32. Method of Eliminating Play on a Worn Lathe. *Machinery,* v. 54, Jan. 1948, p. 157.

With this setup, the inside diameter of aircraft parts is bored to within a total tolerance of 0.0003 in.

20a-33. Selecting the Right Size of Grinding Wheel. John F. Fischer. *Machinery,* v. 54, Jan. 1948, p. 162-163.

Recommended procedure.

20a-34. Fixtures That Increase Production in Parallel-Surface Grinding. R. D. Gardner. *Machinery,* v. 54, Jan. 1948, p. 176-179.

Rotary-type carriers, "feed-through" fixtures, and hydraulically oscillated sliding tables have greatly increased the fields of application and production of double-spindle grinders.

20a-35. Ingenious Mechanisms. *Machinery,* v. 54, Jan. 1948, p. 187-188.

Vise Operated by a Rack and Pinion With Locking Motion, by L. Kasper; Determining the Face Width of Spline Cutters, by Herman A. Neff.

20a-36. Adapting a Lathe for Turning Special Dowel-Pins. Donald A. Baker. *Machinery,* v. 54, Jan. 1948, p. 189-190.

20a-37. Lathe Adapted to Produce Calibrated Fuel-Injection Nozzles. *Machinery,* v. 54, Jan. 1948, p. 193.

System for simultaneous calibration and machining of nozzles ranging in diameter from 0.0004 to 0.004 in.

20a-38. Removal of Chips From Jigs. W. H. Litten. *Machinery* (London), v. 71, Dec. 18, 1947, p. 694-697.

Correct and incorrect designs to facilitate the above.

20a-39. The Capillary Drill. *Machinery Lloyd* (Overseas Edition), v. 19, Dec. 20, 1947, p. 102.

British-made machine for drilling holes down to 0.004 in. in diameter with accuracy.

20a-40. The Locking of Jigs and Fixtures. W. H. Litten. *Machinery* (London), v. 71, Dec. 25, 1947, p. 719-721.

Diagrams show various arrangements for the above.

20a-41. Abrasive Belt Machining for the Toolroom. Harvey L. Ramsay. *Tool & Die Journal,* v. 13, Jan. 1948, p. 56, 58, 78, 80.

20a-42. Combination Grinder-Comparator. *Machine Design,* v. 20, Jan. 1948, p. 149-150.

New machine tool which permits continuous, enlarged comparison of work profiles with "master" drawings while the grinding operation is in progress.

For additional annotations indexed in other sections, see: 21a-6, 24a-1, 27a-2-11-13-21.

20b — Ferrous

20b-1. Effects of Grinding on Physical Properties of Hardened Steel Parts. Howard E. Boyer. *Steel Processing,* v. 33, Dec. 1947, p. 738-741, 760.

Previously abstracted from American Society for Metals Preprint No. 23, 1947. See 20-461, R.M.L., v. 4, 1947 (*Metals Review,* Sept. 1947).

20b-2. Railroad Car Axles Machined Automatically. Walter G. Patton. *Iron Age,* v. 161, Jan. 8, 1948, p. 63-65.

A completely automatic transfer-type machine designed to crop, shear, machine, and face railroad car axle ends. Transfer, positioning, and clamping of the axles are also handled automatically.

20b-3. Planer Makes Helical Cuts. George Lalak. *American Machinist,* v. 92, Jan. 15, 1948, p. 93.

Method and equipment used to machine a profile on the edges of 12 blades welded to the outside in a 30° helix.

20b-4. Automatic Machines Speed Truck-Axle Production. Chester S. Ricker. *American Machinist,* v. 92, Jan. 15, 1948, p. 94-96.

Use of specially designed transfer machine in production of heavy-duty, 6-ton truck rear axles, for drilling, countersinking and tapping; also two new boring and facing machines.

20b-5. Band Saw Blading Now Capable of Cutting 200 Basic Materials and Their Derivatives. H. J. Chamberland. *Steel,* v. 122, Jan. 19, 1948, p. 66-67, 104.

The various types and their applications.

20b-6. Producing the New Studebaker. George E. Westphal. *Machinery,* v. 54, Jan. 1948, p. 139-145.

Machining and heat treating equipment and operations in production of engines and other related parts.

20b-7. Attachment for Turning Rudder Shafts. Joseph Clement and J. A. Kruse. *Machinery,* v. 54, Jan. 1948, p. 168.

20d — Light Metals

20d-1. Band Sawing Aluminum—With and Without Lubricants. H. J. Chamberland. *Modern Metals,* v. 3, Dec. 1947, p. 25-26.

Data on comparative time and costs.

20d-2. Development of a High-Speed Lathe. R. L. Templin. *Machine Design,* v. 20, Jan. 1948, p. 140-142.

Development of a lathe for machining aluminum at surface cutting speeds up to 20,000 ft. per min. Tests on 14S and 14S-T stock and 24S-T plate. (Condensed from paper presented at Annual Meeting of A.S.M.E., Atlantic City, N. J.)

21
MISCELLANEOUS FABRICATION

21a — General

21a-1. The Production of Coiled Springs. *Machinery* (London), v. 71, Nov. 13, 1947, p. 535-540.

Manufacturing methods used at Geo. Salter & Co., Ltd.

21a-2. Coiled Spring Production. *Machinery* (London), v. 71, Nov. 27, 1947, p. 591-597.

Automatic production of the lighter types of springs and inspection and quality-control methods.

21a-3. Light Chain Making Equipment Described. *Wire Industry,* v. 14, Dec. 1947, p. 689-690.

Based on B.I.O.S. Report No. 1346 on German industry.

21a-4. West Made Conveyers. Les Meek. *Western Metals,* v. 5, Dec. 1947, p. 20-21.

Manufacture of various specially designed conveyer systems.

21a-5. Handling Spells Economy at Power Saws. Benjamin Melnitsky. *American Machinist,* v. 92, Jan. 1, 1948, p. 74-75.

How delays can often be avoided by planning materials handling to get full production from power saws.

21a-6. Tricky Tooling Cuts Relay Costs. Paul Bonness. *American Machinist,* v. 92, Jan. 1, 1948, p. 93-95.

Use of ingenious tooling and automatic feeding and clamping to convert standard machine tools into high-production equipment in manufacture of Square D thermal-overload relays.

21a-7. Machine Shops Save Time and Labor With Fork-Lift Trucks. Francis A. Westbrook. *Machine and Tool Blue Book,* v. 44, Jan. 1948, p. 141-142, 144-146.

Used at plant of Cleveland Graphite Bronze Co.

21a-8. Compressed Air and Pneumatic Tools Speed Production. D. H. Palmer. *Machine and Tool Blue Book,* v. 44, Jan. 1948, p. 158-159, 162-164.

Use of compressed air and pneumatic power tools at Ryan Aeronautical.

21a-9. Materials Handling a Prime Factor in Ford Tractor Production. Joseph Geschelin. *Automotive Industries,* v. 98, Jan. 1, 1948, p. 36-39, 74.

21a-10. Buick's New Sheet Metal Plant Features Energy Saving Equipment. *Automotive Industries,* v. 98, Jan. 1, 1948, p. 40-41, 64.

New materials-handling equipment.

21a-11. Materials Handling. *Steel,* v. 122, Jan. 5, 1948, p. 249-250, 253-254, 256.

Brief reports on recent developments: Crane Control Development Allows Use of Cheap Power, by F. M. Blum; Materials-Handling Problems Need Management Cooperation, by R. W. Mallick; American Industry Dependent on Capable Materials Handling, by J. W. Wunsch; Continued Demand Seen for Fork Trucks and Stackers, by F. J. Shepard, Jr.; Outlook Promising for Electric Industrial Truck Industry, by C. B. Cook; Trend Toward Standard Units Seen in Industrial Trucks, by D. L. Darnell; Materials Handling—Key Factor in Production Efficiency, by Elmer F. Twyman; Electric Trucks Substitute for Plant Expansion, by C. F. Kells; Unusual Handling Flexibility Offered by Heavy Trailers, by J. C. Farrell; Inefficient Materials Handling Boosts Product Prices, by Wayne Beldon; Greater Emphasis Placed on Materials Handling, by F. E. Moore; Internal Handling Costs Exceed External Transportation Tariffs, by Ezra W. Clark; Difficult Handling Operations Demand Special Accessories, by Lester M. Sears; Conductor Enclosures Available for Existing Overhead Systems, by A. F. Anjeskey; Industrial Trucks Major Factor in Mechanized Handling, by C. E. Eiler; Push-Button Handling Is Contemplated by Industry, by Jervis C. Webb; Trend Toward Larger Blast Furnace Scale Cars, by E. W. Schellentrager; Battery Maintenance Necessary for Best Plant-Truck Output, by George E. Stringfellow; Power Controls Add Flexibility to Heavy Handling Machinery, by Fred L. White.

21a-12. A Planned Handling System Saves Time and Space at Morse Chain. R. O. Erickson. *Modern Machine Shop,* v. 20, Jan. 1948, p. 164-166, 168, 170, 172, 174, 176, 178.

Procedures and equipment used at Morse Chain Co.

21a-13. Modern Equipment at Work. *Modern Machine Shop,* v. 20, Jan. 1948, p. 184, 190, 192, 194, 196.

Progressive Dual Seam Welder Aids Trailer Body Production; Carboloy Swaging Blocks Reduce Wear in Dies at Underwood; Borizing 13 Surfaces Simultaneously; Reducing Costs With Built-Up Bending Die.

21a-14. How to Analyze and Solve Materials Handling Problems. *Factory Management and Maintenance,* v. 106, Jan. 1948, p. 88-98.

Details and work sheets on two techniques: the method of comparative analysis and the principle of group handling.

(Turn to page 34)

New Alloys to Resist Wear, Heat and Corrosion Are Based on Co, Ni, or Fe

Reported by J. W. Sweet
Chief Metallurgist, Boeing Aircraft Co.

Alloys to resist wear, heat, and corrosion were the basis for an interesting talk by C. G. Chisholm of the Haynes Stellite Co. before the members of the Puget Sound Chapter. Mr. Chisholm included various cobalt-base, nickel-base, and iron-base alloys in his presentation.

The cobalt-base alloys were first developed for use as machine cutting tools where high speeds, heavy feeds, and deep cuts were desired; and also for use as hard facing rods. Haynes Stellite No. 6, a cobalt-chromium-tungsten alloy originally developed for hard facing, was supplied to the Austenal Co. for the manufacture of precision-cast dentures. Molybdenum was later substituted for tungsten to improve ductility, and the new alloy (Haynes Stellite alloy No. 21) was given the trade name "Vitallium" by the Austenal Co.

The denture process of precision casting was adapted for the wartime production of turbosupercharger blades, since it was found that the alloy had all the high-temperature properties required to meet this service. Various modifications of alloy No. 21 (Vitallium) have been developed and are being tested for use as gas-turbine blade material.

Among the nickel-base alloys, Hastelloy A and B were developed for use with nonoxidizing acids, such as hydrochloric and sulphuric. Hastelloy alloy A contains 55% nickel, 20% iron, and 20% molybdenum. Hastelloy alloy B contains 60% nickel, 30% molybdenum, and 6% iron. Hastelloy alloy C is resistant to dilute nitric acid up to about 70° C., and to concentrated nitric acid at atmospheric temperatures; it is also highly resistant to oxidizing acid mixtures. Alloy C contains 51% nickel, 19% molybdenum, 6% iron, and 17% chromium. Because of its oxidation resistance and strength at elevated temperatures, it is being investigated for gas-turbine tail pipe and burner applications. All of these nickel-base alloys are available in the same forms as the stainless steels.

Hascrome iron-base alloy, a chromium-manganese-iron composition, has outstanding resistance to abrasive wear accompanied by severe impact. This alloy also has a high degree of toughness and possesses the valuable quality of workhardening under impact. It is available in castings and as a hard facing material.

Multimet (N-155) alloy was especially developed for high-temperature applications. At present it is being tested for collector rings of reciprocating engines and for tail pipes and burners for gas turbines.

An instructive evening was concluded with the presentation of a group of slides showing typical applications.

New Die Company Formed

W. S. Kisco has formed the Hedalloy Die Corp., Cleveland, to manufacture tungsten carbide tools and dies for the bolt and nut industry. He was formerly associated with the Firth Sterling Steel & Carbide Corp., for the past few years as sales and service engineer in the Cleveland area, and previously as a service engineer covering the United States and Canada from the main plant in McKeesport, Pa. He had previously been with John A. Roebling Sons Co., Trenton, N. J., for about ten years, in various capacities, principally concerned in the maintenance and repair of tungsten carbide dies.

Foxboro Moves Canadian Plant

Foxboro Co., Ltd., affiliated with the Foxboro Co. of Foxboro, Mass., has moved into a new building in Montreal. The Canadian company manufactures virtually the entire line of Foxboro instruments for measurement and control.

Belgian Engineers Convene For International Salon

To celebrate the centenary of its foundation, the Association des Ingénieurs Sortis de l'Ecole de Liège (Belgium) has organized a congress and exposition to be held in Liège next August. As part of the proceedings, an "International Salon of Scientific Research and Industrial Control" will be officially opened on Aug. 9, 1948, by P. H. Spaak, Prime Minister, and other members of the Government.

Object of the Salon is to show equipment and methods developed by scientific research for industry. Nearly 200 foreign firms will be represented, including 48 American companies.

Acheson Colloids Effects Merger

In a move which brings together under single ownership and management two of the largest producers of colloidal graphite products, Acheson Colloids Corp. of Port Huron, Mich., has purchased its British counterpart. Through its wholly owned subsidiary, Acheson Colloids Ltd., London, England, the American company has bought the entire operating assets of E. G. Acheson Ltd., which, in spite of the similarity in name, was a completely independent concern.

21a-15. Manufacture of the de Havilland Dove Light Transport. *Aircraft Engineering,* v. 19, Dec. 1947, p. 393-401.

21a-16. Materials Handling. Robert E. Wright. *Industrial and Engineering Chemistry,* v. 40, Jan. 1948, p. 45-48.
Reviews developments of 1947.

21a-17. Compressed Air Used as Major Power Source in Building Conveyers. *Steel,* v. 122, Jan. 19, 1948, p. 80-82.
Numerous miscellaneous uses in plant of Robins Conveyors Division of Hewitt-Robins, Inc.

21a-18. Printed-Circuit Techniques. Cledo Brunetti and Roger W. Curtis. *Proceedings of the I.R.E.,* v. 36, Jan. 1948, p. 121-161.
Circuits are defined as being "printed" when they are produced on an insulated surface by any process. The methods fall in six main classifications: painting; spraying; chemical deposition; vacuum processes; die-stamping; and dusting. 60 ref.

21b — Ferrous

21b-1. The Production of Pliers. *Machinery* (London), v. 71, Nov. 20, 1947, p. 563-567.
Methods used by British firm.

21b-2. Manufacture of Flexible Roller Bearings. *Machinery* (London), v. 71, Dec. 4, 1947, p. 619-623.
Methods used by a British firm.

21b-3. Modern Material Handling in a High-Carbon Wire Mill. LeRoy D. Seymour. *Wire and Wire Products,* v. 23, Jan. 1948, p. 45-46, 98.
Methods and equipment used by John A. Roebling's Sons Co.

21b-4. Roamin' Numerals. O. A. Battista. *Steelways,* Jan. 1948, p. 6-7.
Manufacture of license plates from hot rolled steel.

21b-5. The Long Knives of Collinsville. Richard Wilcox. *Steelways,* Jan. 1948, p. 8-11.
Production of the knives known as machetes.

21b-6. Overhead Coil Conveyer Saves Space for Other Mill Operations at Weirton Steel. *Steel,* v. 122, Jan. 19, 1948, p. 73.

21b-7. Golf Club "Irons" From Stainless Steel. Arthur Q. Smith. *Industrial Gas,* v. 26, Jan. 1948, p. 12-13.
Production methods and equipment.

For additional annotations indexed in other sections, see: 22b-2.

21c — Nonferrous

21c-1. Gridded Bearings. *Mechanical Engineering,* v. 70, Jan. 1948, p. 32-33.
New process developed by American Brake Shoe Co., by which centrifugally cast, Pb-Sn bronze is gridded by a simple, mechanical, mass-production method.

21d — Light Metals

21d-1. Aircraft Know-How Applied to Truck Aluminum Bodies. R. W. Graham. *Automotive Industries,* v. 98, Jan. 1, 1948, p. 44-45, 70.
All-aluminum truck and trailer bodies produced by using designs and assembly methods based on aircraft experiences.

22
JOINING and FLAME CUTTING

22a — General

22a-1. Welding Heat Resisting Alloys for Jet Engine Construction. E. W. Harding. *Welding,* v. 15, Nov. 1947, p. 504-511.
Techniques which overcome difficulties commonly encountered when resistance welding the special nickel alloy steels. A method of calculating correct pressures for seam welding. The process for joining mild steel to stainless steel.

22a-2. Choose the Right Electrode; a Guide to Properties and Applications. (Concluded.) W. D. Waller. *Welding,* v. 15, Nov. 1947, p. 521-529.
Electrodes for copper-bearing steels; austenitic stainless electrodes; weld tests; lime-ferritic electrodes. Electrode prices compared; other factors pertinent to selection of the right size and type of electrode for a specific job.

22a-3. Resistance Welding in Mass Production; Principles of Seam Welding. A. J. Hipperson and T. Watson. *Welding,* v. 15, Nov. 1947, p. 530-534.
Fundamentals of the process, as well as variables such as pressure, current, track width, and speed.

22a-4. Oxygen Cutting; Suitable Fuel Gases. E. Seymour Semper. *Welding,* v. 15, Nov. 1947, p. 535-536.
The applicability of different fuel gases.

22a-5. Oxy-Gas Cutting; Various Gases Compared With Acetylene. A. H. Taylor and T. Bound. *Welding,* v. 15, Nov. 1947, p. 536-543.
Results of a series of tests on mild-steel bars using acetylene, propane, propane enriched with ether, coal gas, and coal gas enriched with ether.

22a-6. The Dissociation of Nitrogen in the Welding Arc. J. D. Fast. *Philips Research Reports,* v. 2, Oct. 1947, p. 382-398.
For temperatures from 5000 to 10,000° K., the dissociation is computed on the basis of spectroscopic data for three different values of the dissociation energy. 21 ref.

22a-7. Here's a New Way to Make Things Tough for a Caterpillar Tractor. Ray Larson. *Weld,* v. 3, Dec. 1947, p. 6-8.
Setup for automatic hard facing of Caterpillar tractor track rollers.

22a-8. Joining and Welding. *Steel,* v. 122, Jan. 5, 1948, p. 202, 204, 207-209.
Brief reviews of new developments: Pressure Welding Used to Join Steam Piping, by R. A. Kubli; Notes Rapid Progress in Structural Welding, by LaMotte Grover; Tremendous Savings Realized Through A.C. Arc Welding, by C. P. Croco; Modern Methods Improve Fastener Strength, Accuracy, by Harry O. McCully; Inert-Gas Shielded Arc Welding Applicable to Many Metals, by H. T. Herbst; New Applications Noted for Submerged Melt Welding, by Norman G. Schreiner; Inert-Arc Welding Affords Wider Range and Flexibility, by G. O. Hoglund; Demand for Double-Duty Fastening on the Increase, by George A. Tinnerman; Use of Low-Hydrogen Welding Electrode Gains Steadily, by Pierre Champion; Arc Welding Applied to New Metals Creates Problems, by Robert E. Kinkead; Sees Need for Simplified Resistance Welding Controls, by G. N. Sieger; Fracture Bend Tests Used to Evaluate Weldability, by John J. Chyle; Various Welding Methods to Affect Parts Design, by Joseph W. Meadowcroft; Drive Large Rivets Cold Using Controlled Safe Pressures, by W. E. Fowler, Jr.; New Alloys and Fluxes Improve Aluminum Brazing, by H. A. Huff; Flash Butt Welding Applied to Heat Resisting Alloys, by I. A. Oehler; More Versatility Noted for Arc Welding Process, by A. N. Kugler; Metals Placed Strategically in Welded Machine Tool Designs, by A. F. Davis; Inert-Gas Shielded Arc Welding Available for Mass Production, by H. O. Jones; Submerged Arc and Inert-Gas Welding Improved, by R. B. Lincoln; Resistance Welding Expands Through New Developments, by Fred Johnson; Investigations Help Fabricators Select Steels for Spot Welding, by J. Heuschkel.

22a-9. 1947 Found Welding Again Winning Rightful Place. T. B. Jefferson. *Welding Engineer,* v. 33, Jan. 1948, p. 33-35, 79.
Review of developments.

22a-10. Production Methods of Low-Temperature Silver Alloy Brazing. A. M. Setapen. *Steel Processing,* v. 33, Dec. 1947, p 761-765.

22a-11. The ABC's of Silver Alloy Brazing. W. J. Van Natten. *Iron Age,* v. 161, Jan. 8, 1948, p. 51-55.
Fundamentals. The characteristics of ten well-known silver brazing alloys. Fluxing and heating; joint design and part preparation.

22a-12. How to Handle and Take Care of D.C. Arc Welders. John Morrill. *Factory Management and Maintenance,* v. 106, Jan. 1948, p. 122-125.
Practical recommendations.

22a-13. Rail Welding; Success of New Development. *Welding,* v. 15, Dec. 1947, p. 571-572.
Oxy-acetylene welding of copper conductors to rails with no harmful effect on the rail metal.

22a-14. Consider These Factors When Welding High-Temperature Alloys. C. G. Chisholm. *Industry and Welding,* v. 21, Jan. 1948, p. 30-32, 59-61.
Previously abstracted from *Steel,* v. 121, Dec. 29, 1947, p. 54-56, 58, 60. (Presented at 28th Annual Conference of A.W.S.) See 22-783, R.M.L., v. 4, 1947 (*Metals Review,* Jan. 1948).

22a-15. Welding for Science and Industry. *Industry and Welding,* v. 21, Jan. 1948, p. 40-42, 44, 64-65.
Use of welding and cutting in repair, maintenance, and construction of exhibits at Chicago's Museum of Science and Industry.

22a-16. Designing for Resistance Welding. Ernie Lauter. *Industry and Welding,* v. 21, Jan. 1948, p. 62-64.
Miscellaneous cost saving ideas.

22a-17. Heliarc Welding for the Difficult-to-Weld Metals and Alloys. H. T. Herbst and F. J. Pilia. *Product Engineering,* v. 19, Jan. 1948, p. 127-131.
Joint constructions, limitations on thicknesses of materials, weld strengths relative to strengths of base metals, and other information for use in designing parts and articles for fabrication by Heliarc welding. Comparison with other welding methods.

22a-18. Copper Furnace Brazing. *Machinery* (London), v. 71, Dec. 18, 1947, p. 683-688.
Equipment and methods used in large-scale industrial operations. Based on work in the U. S.

For additional annotations indexed in other sections, see: 2a-1-2, 12a-6, 24a-3, 27a-9.

22b — Ferrous

22b-1. Railway Wagon Production at the Derby Works of the L.M.S.R. *Welding,* v. 15, Nov. 1947, p. 512-515.
Welding jigs and procedures.

22b-2. Excavating Machinery; Use of Fabricated Units. T. W. Broughton. *Welding,* v. 15, Nov. 1947, p. 516-519.
Fabrication procedures, which include welding.

22b-3. Shape Welding by Submerged Melt Process. J. A. Kratz. *Welding Engineer,* v. 33, Jan. 1948, p. 36-39.
How continuous machine welds can be made to follow prescribed outlines by mounting a submerged-melt head on the templet-guided carriage of an ordinary shape cutting machine. (Condensed from paper presented at annual meeting, American Welding Society, Chicago, Oct. 18-24, 1947.)

22b-4. Stud Welding in Great Britain. A. H. Bent. *Welding Engineer,* v. 33, Jan. 1948, p. 40-42.

(Turn to page 36)

Trend to Use of H-Band Specification Gains Momentum

Reported by Jack W. Hobbs

Akron Welding and Spring Co.

Speaking on "Properties and Performance of Steel", Harry B. Knowlton, materials engineer for International Harvester Co., on Dec. 10 addressed the Akron Chapter ⊛, the former home of International Harvester's Truck Division.

A good metallurgist, according to Mr. Knowlton, is a man who not only selects a satisfactory steel for a definite job, but who also chooses a steel which will guarantee satisfactory performance in service at a minimum cost to the ultimate user. The first requirement of any person in a profession is common sense, and such is the prime requisite for a metallurgist. The question, "What does the job have to do, and how long does it have to live?" should be one of the first self-directed questions for all metallurgists.

The National Emergency steels in the main have proven satisfactory, Mr. Knowlton believes. Scarcity of alloying elements forced their use, and success was dependent largely upon the fact that they were based upon hardenability values equivalent to those of previous steels.

Mr. Knowlton discussed the question of purchasing steels under hardenability, or H-band specifications—a trend that is gaining momentum. Users (such as the International Harvester Co.) have found that the new H-steels, in spite of their broader limits of composition with regard to individual elements, behave in a more uniform manner in the heat treat than do the standard chemical grades.

By applying the Jominy test to heats falling within the same classification, such as 4140 or 4130, it has been found that each classification is made up of a family of steels, not just one steel. There is considerable variation in the hardenability of heats falling within the same chemical classification.

The speaker stressed the use of field tests and simulated service tests in making decisions, and pointed out that laboratory tests are run to disclose pertinent information with regard to finished parts—how long they lived, how much work they did, and why they failed to live any longer.

Clad Metal Rolling Mill Projected

The first rolling mill designed especially to make only clad metals will soon be in operation by American Cladmetals Co. at Carnegie, Pa., in a plant 800 ft. long by 125 ft. wide. Copper sandwiched between layers of stainless steel will be manufactured, and the company's development program also involves cladding of other metals such as aluminum to steel and silver to steel.

Two Alloy Steels Could Handle 95% of All Applications — Schlegel

Reported by A. R. Kunkle

York Ice Machinery Corp.

Two steel compositions could be used for approximately 95% of all applications requiring alloy steels, W. A. Schlegel maintained in an address before the York Chapter ⊛ on Dec. 10. Mr. Schlegel, who is metallurgist for Carpenter Steel Co. and was awarded the Howe Medal of the A.S.M. in 1941, spoke on "Simplification of Selection of Constructional Alloy Steels".

The two steels Mr. Schlegel described were designated No. 5-317 (0.50% C, 0.50% Mn, 0.20% Si, 1.00% Cr, 1.75% Ni) and No. 158 (0.10% C, 0.30% Mn, 0.20% Si, 1.50% Cr, 3.75% Ni). No. 5-317 is of the oil hardening type and No. 158 is the case carburizing type.

Instead of choosing from the hundreds of alloy steels now available, the designer's problem would be greatly simplified by using one of these two steels, Mr. Schlegel pointed out. The functions of the procurement department, the cutting oil engineers and the steel manufacturers would also be greatly simplified.

A broad range in physical properties is possible and quite practical with both of these steels, subjected to various heat treatments. Slides illustrated certain mechanical parts used in various types of industry that had previously been made from different alloy steels, and are now satisfactorily made from these two steels.

British equipment for arc welding steel studs to steel plates resembles stud welding guns used in the U. S.

22b-5. Weight Saved: 20%. *Welding Engineer*, v. 33, Jan. 1948, p. 43.

How weld fabrication of a saddle for the lifting frame of a pallet-type lift truck saves weight and cuts machining costs.

22b-6. Hard Facing Brings Longer Life to Cane Cutters. *Welding Engineer*, v. 33, Jan. 1948, p. 52-53.

Application to machinery for cutting sugar cane.

22b-7. Prefabricated Ship Assembly. Margaret Ralston. *Welding Engineer*, v. 33, Jan. 1948, p. 60, 62.

How a Seattle shipbuilder built a 70-ft. fishing vessel in three parts and welded them together on the ways.

22b-8. Weld Repair of Gray Iron Castings. *Foundry Trade Journal*, v. 83, Dec. 11, 1947, p. 306, 308.

Based on article in *Iron Age*.

22b-9. Fabricated Oil Engine Structures; the Redesign of the Two-Stroke Type. C. B. M. Dale. *Welding*, v. 15, Dec. 1947, p. 555-558.

Welded redesign of the Petter Super-scavenge two-stroke oil-engine.

22b-10. Production Control; Factors Relating to Arc Welding. D. M. Kerr. *Welding*, v. 15, Dec. 1947, p. 559-567. Condensed from paper presented to the Institute of Welding.

Methods for control of arc welding in shipbuilding. Factors affecting production speeds, costs, rate fixing, influence of joint size and type, and also the preparation of work schedules.

22b-11. The Fuse-Bond Process; Principles and Applications. J. Porter. *Welding*, v. 15, Dec. 1947, p. 568-571.

A new, patented process similar to welding which has been adopted for the preparation of surfaces prior to the reclamation of worn parts by metal spraying. A special alloy is deposited on the surface to be sprayed, forming a preparation which results in a bond stronger than the sprayed metal itself.

22b-12. Oxygen Cutting; Sources of Gas Supply. E. Seymour Semper. *Welding*, v. 15, Dec. 1947, p. 573-579.

Concluding article of a comprehensive series dealing with various aspects of oxygen cutting.

22b-13. How to Cut Costs in Grinding and Finishing Welded Stainless Steel. H. H. Schultz and George Kopp. *Industry and Welding*, v. 21, Jan. 1948, p. 26-29, 52, 55.

Welding and grinding techniques used by Steel and Tube Products Co., Milwaukee.

22b-14. Welding Time Cut 75%. Axel Sundstrom. *Industry and Welding*, v. 21, Jan 1948, p. 51.

Use of automatic metallic arc welding in fabrication of residential and industrial heating boilers has reduced welding time to one-quarter of that required when manual welding was exclusively used.

22b-15. Some "Tips" on the Latest Use of Oxy-Acetylene Flame in Track Work. *Railway Engineering and Maintenance*, v. 44, Jan. 1948, p. 50-53.

Driver Burns, Corrugations and Hardening of Openhearth Frogs, by C. A. Daley; Hardening Rail Ends and Frogs, by R. W. Torbert.

22b-16. Welded Steel Locomotive Fireboxes. *Machinery* (London), v. 71, Dec. 11, 1947, p. 657-660.

Fabrication at the Brighton Works of the Southern Railway Co., England.

22b-17. Mechanized Welding of Cylindrical and Spherical Shells. *Machinery*, v. 54, Jan 1948, p. 164-165.

Condensed from paper by H. T. Herbst before recent annual meeting of American Welding Society.

22b-18. Laying of Flat Bead Increases Production. *Steel*, v. 122, Jan. 19, 1948, p. 100.

Use of above welding method in the fabrication of cabinets for teletype printers.

22b-19. How Trailbuilder Units Were Designed for Arc Welding. G. J. Storatz. *Machine Design*, v. 20, Jan. 1948, p. 143-148, 185. Condensed from a James F. Lincoln Arc Welding Foundation prize-winning paper.

Design and fabrication of key units of a modern trailbuilder (bulldozer). Cost estimating for arc-welded structures.

For additional annotations indexed in other sections, see: 3b-5, 15b-1-2, 23b-6, 24b-7.

22c — Nonferrous

22c-1. Controlled Techniques Developed to Flash Weld Copper Coils. *Steel*, v. 122, Jan. 12, 1948, p. 66-67.

Equipment and methods used in manufacture of the 2300-ton magnet structure of Columbia University's cyclotron; 1200 perfect copper welds were completed in one phase of the program.

23 APPLICATIONS

23a — General

23a-1. Detroit-Evolution, Not Revolution. W. G. Patton. *Iron Age*, v. 161, Jan. 1, 1948, p. 156-167.

What to look for in the 1948-1949 cars as well as in the car of 1952. New and improved production techniques include: use of stainless-clad bumpers; use of extruded and rolled aluminum sections; a complete overhaul of existing forging practice, including better materials handling, new heating practice, substitution of hot extrusion for many hammer and press operations, and use of salt baths for preheating and annealing; use of lower carbon in gears; use of automatic transfer devices; expansion of projection welding; improvements in foundry operations.

23a-2. For Top-Notch Diesel Operation Know Your Sleeve-Bearing Fundamentals. *Power*, v. 92, Jan. 1948, p. 84-87, 160, 166. Based on four papers presented at 19th National Oil and Gas Power Conference of the A.S.M.E., by E. Crankshaw and G. W. LaPier; B. J. Esarey; W. Thill; and D. B. Wood.

Improved bearings developed to meet today's heavier demands. (To be continued.)

23a-3. Zink und Eisen. (Zinc and Iron.) Artur Kutzelnigg. *Mitteilungen des Chemischen Forschungsinstitutes der Industrie Österreichs*, v. 1, Oct. 1947, p. 89-91.

The many possible combinations of zinc and iron and their uses. 21 ref.

23a-4. Materials Used in the New Buick Automatic Transmission. Herbert Chase. *Iron Age*, v. 161, Jan. 15, 1948, p. 74-77.

Materials include die castings, plaster castings, gray-iron castings, rolled steel, various copper-base alloys and synthetic rubber. An explanation of the general functioning of the components.

23a-5. Wire in the Automobile. F. Titus Updike. *Wire and Wire Products*, v. 23, Jan. 1948, p. 29, 31-34.

Uses of wire in a modern motor car. (Presented at Annual Wire Association Convention, Chicago, Oct. 1947.)

23a-6. Alloys for High-Temperature Service. *Metal Industry*, v. 71, Dec. 26, 1947, p. 524.

New developments as revealed by recent papers.

23a-7. Improved Metals Promise Design Progress. *Machine Design*, v. 20, Jan. 1948, p. 103-107.

Important recent developments in low and high-alloy steels; stainless steels; cobalt-base alloys; and powder metallurgy.

For additional annotations indexed in other sections, see: 2a-2, 3a-1.

23b — Ferrous

23b-1. A Prototype Stainless Steel Coach. *Engineer*, v. 184, Nov. 28, 1947, p. 512-513.

23b-2. Steel Castings; Uses as Engineering Materials. John A. Rassenfoss. *American Foundryman*, v. 12, Dec. 1947, p. 38-44, 59.

Previously abstracted from *Steel*. See 23-551, R.M.L., v. 4, 1947 (*Metals Review*, Jan. 1948).

23b-3. C.A.A. Segmented Airport Marker Utilizes Porcelain Enamel. *Finish*, v. 5, Jan. 1948, p. 22-23.

New application of enamel.

23b-4. How We Use Porcelain Enamel in the Production of Electric Signs. Herbert B. Link. *Finish*, v. 5, Jan. 1948, p. 27-29.

23b-5. Stainless Steels for the Chemical Engineering Industries. I. Berkovitch. *Iron and Steel*, v. 20, Dec. 1947, p. 648.

Reviews paper on the general resistance to corrosion of various commercial stainless steels by L. Rotherham, presented to the Society of Chemical Industry.

23b-6. Welded Highway Deck Cuts Dead Load on Eads Bridge. Joshua D'Esposito, Jr. *Engineering News-Record*, v. 140, Jan 8, 1948, p. 88-91.

23b-7. Stainless Steel Railway Coach. *Engineering*, v 164, Dec. 19, 1947, p. 584-586, 588

Manufactured by Budd in Philadelphia.

23b-8. Maintenance of Stainless Steel Equipment in Refineries. Article 1. Types and Their Applications, Welding, Intergranular Corrosion. W. G. Renshaw. *Petroleum Processing*, v. 3, Jan. 1948, p. 25-28.

Types useful when sulphur compounds are encountered are described, as well as those suitable for applications at high and subzero temperatures.

For additional annotations indexed in other sections, see: 27b-6.

23c — Nonferrous

23c-1. Cesium Chromate Photo-Tube Pellets. H. A. Liebhafsky and A. F. Winslow. *Journal of Applied Physics*, v. 18, Dec. 1947, p. 1128-1132.

An exploratory investigation of the pellets used in the manufacture of photo tubes; hydrogen evolution or titration can be used to measure the yield of cesium with reasonable precision. Effects of substitution of Ti or Zr for Si as reducing agent (no marked advantage observed) and effects of substituting Mo for Ni in the pellet holders (use of Mo eliminated difficulty caused by formation of hydrogen by reaction of Ni with water vapor). Suggestions for further research.

23c-2. Present Trends in Nickel Alloys. *Western Metals*, v. 5, Dec. 1947, p. 43.

A review of 1947 highlights based on a report by the research and development division of International Nickel Co.

23c-3. Hard Materials for Rock Bits. Part II. R. W. Adamson. *Mining Congress Journal*, v. 33, Dec. 1947, p. 46-49.

The various tests used in the development of a tungsten carbide insert bit. (Concluded.)

(Turn to page 38)

Numerous Uses of Electroplating Mark 20 Years' Progress

Reported by George Dinges

Nordberg Mfg. Co.

Speaking on "Twenty Years of Electroplating" before the Milwaukee Chapter ⚙ in December, Frank K. Savage, assistant to vice-president of Standard Plating Rack Co., Chicago, pointed out that the reasons for electroplating are more numerous than generally supposed. Electrorefining, for example, is gaining in favor because the allied metals can be salvaged in the process.

Electroforming is an interesting application of the science. In this process, complex shapes of fairly uniform cross sections are molded in an electrolytic bath. In electroforming a bell shape used for a horn, the pattern is first coated with a conducting mixture such as graphite and wax for conductivity and drawing properties of the pattern from the formed part.

Copper plating is used in deep drawing operations; silver plating is used on bearings to prevent seizure; chromium plating, among other applications, is used for salvage work and wear resistance. Indium plating is sometimes applied to enhance the properties of silver plate.

The history of electroplating is marked by changes in technique because of necessity, by engineering changes, and by a gradual increase in current densities. Rochelle salts, for instance, were at a time considered worthless until their value was discovered as an addition to a cyanide copper bath. The reason for using a deadly poison such as cyanide in a copper plating bath is to cut down the ionization, which will decrease the plating by immersion effect. A temporary shift back to the old acid copper bath was forced by the war and the shortage of nickel. Addition agents, temperature controls, filters and rectifiers are a few additional developments during the past 20 years.

The future of electroplating lies partly at least in the success of the various research projects sponsored by the American Electroplaters' Society, which are being conducted throughout the country—mostly at universities. These projects include work on copper stripping, determination of impurities in plating solutions, method of testing for adhesion, and disposal of plating room waste solutions.

Engineering Uses Of Cast Iron Listed

Reported by Harold W. Schmid

General Metals Corp.

Prefacing a most informative lecture on the engineering properties of cast iron, James T. MacKenzie, technical director of the American Cast Iron Pipe Co., called attention to some of the applications where cast iron is eminently superior. Dr. MacKenzie addressed the January meeting of the Texas Chapter ⚙. Further details of his talk are given in the report of the North Texas Chapter on page 31.

The use of cast iron for brake drums in automotive equipment is especially noteworthy, he said. Cast iron is also excellent in uses where its superior damping characteristics are important. In this category heavy machine frames and gears are examples. The third use of note is for parts where the corrosion resistance of cast iron may be utilized to advantage.

Dr. MacKenzie continued by covering some of the details of melting practice and the problem of set (or permanent size change under stress) sometimes encountered in cast iron. This, he showed, can be overcome in many instances by prestressing or preloading the casting.

A number of charts covering the various cast irons and their relationship to other ferrous engineering materials served to illustrate the wide range of properties which can be secured by the proper selection and specification of cast iron.

23c-4. Additional Advantages: Compactness; Economy; Accuracy. Oscar F. Larsen. *Die Castings,* v. 6, Jan. 1948, p. 22-24, 46-47.

Uses of die castings in calculating machines.

23c-5. Design of a Combination Heater-Fan. *Die Castings,* v. 6, Jan. 1948, p. 25-26, 47-50.

How the use of thread-cutting screws and special fasteners for rapid assembly has been made practical by use of zinc-base die castings.

23c-6. Fire Feeder. L. B. Harrington. *Die Castings,* v. 6, Jan. 1948, p. 29-30, 51-54.

Redesign of pump for fuel oil for use in domestic and other space-heating units, from iron castings to die castings.

23c-7. Minerals for Chemical and Allied Industries: A Review of Sources, Uses and Specifications—Part XV. Sydney J. Johnstone. *Industrial Chemist and Chemical Manufacturer,* v. 23, Dec. 1947, p. 794-800.

Nickel and its uses. (To be continued.)

23c-8. Some Photo-Electric Thresholds for Geiger-Muller Counters With Evaporated Cathodes. C. A. Ramm. *Journal of Scientific Instruments,* v. 24, Dec. 1947, p. 320-321.

Measurements with several cathode metals to determine the influence on the photo-electric thresholds of Geiger-Muller counters. Gold has desirable properties for counters with evaporated cathodes.

23d — Light Metals

23d-1. Three Exhibitions Reported. *Light Metals,* v. 10, Dec. 1947, p. 612-621, 623-628.

Numerous applications of the light metals, shown at exhibitions of the building, dairy, and brewing industries in Britain.

23d-2. Simplifying Bodywork Construction and Assembly. *Light Metals,* v. 10, Dec. 1947, p. 629-633.

A simplified system of prefabricated cab and bodywork construction. In addition to sheet and extruded sections of aluminum alloy, castings are also used in the standard assemblies.

23d-3. Ten Years' Hard! *Light Metals,* v. 10, Dec. 1947, p. 646-650.

Results of ten years' service of about 350 trucks equipped with aluminum alloy bodies and cabs.

23d-4. Aluminum Stretches Steel Supply for Cars—1948. James R. Custer. *Automotive Industries,* v. 98, Jan. 1, 1948, p. 29, 58.

Trend in substitution of aluminum for steel.

23d-5. Ford 100-Hp Truck Engine Modified to Give 175 Hp. *Automotive Industries,* v. 98, Jan. 1, 1948, p. 46, 84.

Main components consist of cast aluminum alloy heads; dual carburetors; aluminum manifolding and induction system; radially inclined, overhead, intake and exhaust valves with dual valve springs, rocker arms and push rods; aluminum valve cover; and extension pipes fitted around the spark plugs to protect them from valve-gear lubricating oil.

23d-6. Synagogue Reroofed With Aluminum. *Sheet Metal Worker,* v. 38, Dec. 1947, p. 55.

Recommended phosphating and coating techniques included.

23d-7. Experiences With Aluminum Electrical Conductors in Aircraft. B. M. G. Wolfframm. *Technical Data Digest,* v. 13, Jan. 1, 1948, p. 7-13.

Although, in general, the material situation in Germany did not permit the use of aluminum cables, the development of terminals had progressed so far that no technical difficulties were expected. The danger of corrosion could be avoided by use of bimetallic sleeves.

23d-8. Aluminum Permanent Mold Castings. E. G. Fahlman. *Light Metal Age,* v. 5, Dec. 1947, p. 6-12.

Advantages, applications, and trends. Suggestions for design and selection of alloys.

23d-9. All Metal Finishes for Commercial Plants. Stephen Porter Lathrop. *Light Metal Age,* v. 5, Dec. 1947, p. 21.

Use in baking plant of "Renolite", which consists of plywood faced with sheet aluminum.

23d-10. Magnesium Bows and Landing Nets. P. V. Leivo. *Modern Metals,* v. 3, Dec. 1947, p. 19.

New applications in archery and fishing.

23d-11. From Cow Barn to 5th Avenue. *Modern Metals,* v. 3, Dec. 1947, p. 20-21.

Lawn and garden furniture and decorative items of cast aluminum being made in a barn.

23d-12. Heavy-Duty Light Alloy Engines. *Modern Metals,* v. 3, Dec. 1947, p. 22-23.

Production and design of 10-hp., 4-cycle, air-cooled engines for refrigeration compressors.

23d-13. Self-Priming Aluminum Centrifugal Pumps. *Modern Metals,* v. 3, Dec. 1947, p. 24-25.

Features of the Marlow pump and reasons for utilization of aluminum in its construction.

23d-14. Sew Efficient. H. K. Barton. *Die Castings,* v. 6, Jan. 1948, p. 21, 44-45.

Use of aluminum-alloy die castings in the housing of Swiss sewing machine.

23d-15. No Mistake. *Die Castings,* v. 6, Jan. 1948, p. 31, 54.

Use of aluminum die castings for electric erasing machine.

23d-16. Recent Developments in the Uses of Aluminum. G. R. Black. *Canadian Metals & Metallurgical Industries,* v. 10, Dec. 1947, p. 16-19.

23d-17. Light Alloys in the Internal-Combustion Engine. *Light Metals,* v. 10, Dec. 1947, p. 651-659.

The value of aluminum alloys for cylinder heads; problems connected with the use of steel studs and bolts; fuel savings. (To be continued.)

24

DESIGN and STRESS ANALYSIS

24a — General

24a-1. Machine Taps. *Machinery* (London), v. 71, Nov. 20, 1947, p. 574-575.

Recomended designs, especially of the fluted part.

24a-2. Moving Loads on Continuous Beams. J. J. O'Donovan. *Engineering,* v. 164, Nov. 21, 1947, p. 484-486; Nov. 28, 1947, p. 509-510.

A mathematical and graphical development.

24a-3. Equipment. *Steel,* v. 122, Jan. 5, 1948, p. 217-218, 220-222.

Brief reviews of recent developments: Steeple-Type Vertical Worm Gear Reducer Developed, by R. C. Ball; Mill Operators' Demands Met by Equipment Manufacturers, by F. E. Walling; Resistance Welding Machines Designed for High Production, by G. W. Garman; Industrial Plants Built With Controlled Conditions, by J. K. Gannett; New Metallizing Unit Makes Many Spraying Speeds Possible, by L. E. Kunkler; Equipment for Flame Cutting Stainless Steel Introduced, by G. E. Bellew; Welding Control Manufacturers Offer New Safety Equipment, by C. B. Stadum; Axial Air Gap Motor Used in Certain Machine Applications, by H. A. Bamford; Special Resistance Welding Machines More Widely Used, by F. R. Hensel; Recruiting Maintenance Men Problem in Smaller Plants, by J. C. Hanna; Progress in Electrical Equipment Continues, by Ernest E. George; Uses of Flexible Metal Tubing Become More Varied, by S. H. Collom, Jr.; Welding Performance Improved by New Equipment, by C. I. MacGuffie; Machine Tool Advancements Attributed to Controls, by D. W. McGill; Use for Precision Cast Superalloys to Increase in 1948, by W. O. Sweeny; Qualified Mechanics Seen as Great Industrial Need, by Walter J. Brooking; New Electrical Equipment for Sheet and Tinplate Mills, by G. E. Stoltz; Reversing Hot Strip Mill Has Unusual Feature, by H. W. Poole; Underbead Cracking Eliminated by Lime-Ferritic Electrodes, by J. H. Deppeler.

24a-4. The Elasto-Plastic Stability of Plates. A. A. Ilyushin. *National Advisory Committee for Aeronautics, Technical Memorandum No. 1188,* Dec. 1947, 30 pages. Translated from *Prikladnaia Matematika i Mekhanika,* X, 1946.

The stress-strain relations developed by the author in previous work for use beyond the elastic range are simplified and applied to thin plates, in the elastic, the elastoplastic, and the plastic zones. The stability of plates compressed beyond the elastic range is studied and examples are given of exact and approximate solutions.

24a-5. Putting Inserts to Work in a ¾-Ton Puller. *Die Castings,* v. 6, Jan. 1948, p. 40-43.

Design details of device resembling a chain hoist, but made for horizontal pulling, and built primarily of aluminum die castings. Inserts consist of: sintered bronze bushings; a hardened steel ratchet; a forged steel chain guide; and a steel sleeve.

24a-6. Recording Stress Level Gage. R. C. Walker and J. H. Meier. *Product Engineering,* v. 19, Jan. 1948, p. 138-139.

Gage for permanent installation on large structures in order to record over long periods of operation the stresses that result from loads on structural members.

24a-7. Designing for Shock Resistance. Geert Beling. *Product Engineering,* v. 19, Jan 1948, p. 140-143.

Methods for shock measurement and shock testing. Four methods for shock proofing; design procedures.

24a-8. Lubrication Factors in Bearing Design. *Machinery,* v. 54, Jan. 1948, p. 146-153.

24a-9. Profile Gage Problem. Henry R. Bowman. *Machinery,* v. 54, Jan. 1948, p. 175.

Problem in connection with manufacture of ordnance shells is worked out.

24a-10. Some Elementary Considerations of the Stress-Strain Curve. R. M. Howarth. *Aircraft Engineering,* v. 19, Dec. 1947, p. 372-377.

Application to aircraft design and utilization.

24a-11. Laying Out Tooth Forms for Spline Shaft Hobs. F. E. Lindsay. *Machinery* (London), v. 71, Dec. 18, 1947, p. 689-693.

24a-12. The Wire Resistance Strain Gage. P. Savic. *Research,* v. 1, Dec. 1947, p. 98-106.

Fundamental principles, method of construction, and applications. 11 ref.

24a-13. The Boundary-Valve Problems of Plane Stress. Part I. G. H. Livens and Rosa M. Morris. *Philosophical Magazine,* 7th Series, v. 38, March 1947, p. 153-179.

A mathematical development, using a slight modification of the method of Stevenson and Green in combination with a method developed by one of the authors for problems of hydrodynamics and elasticity. Fundamental equations for stresses and displacements; characteristic stress potentials; effect of an elliptical hole on a specified stress distribution; the stressed boundary problem. 12 ref.

(Turn to page 40)

Special Problems in Chain Manufacture Tax Metallurgical Knowledge

In his talk on the "Manufacture and Metallurgy of Roller Chains", before the Notre Dame Chapter's January meeting, Arthur E. Focke, chief metallurgist, Diamond Chain Co., Inc., Indianapolis, Ind., described the problems that metallurgists have to face in that industry.

Roller chains are produced in large quantities, and in a wide variety of sizes, Dr. Focke pointed out—from those so small that the entire drive can be put conveniently in a man's pocket, to others which weigh several hundred times as much, and which operate over sprockets larger in diameter than the height of a man. These chains are used in over 119 separate industries for transmitting power, transferring motion, or transporting objects.

In discussing the single-load breaking strength (tensile strength) of roller chains, the speaker pointed out that while this value is very useful in daily acceptance test on the company's product, its importance in selecting roller chains for normal service can be greatly overemphasized. As examples, he described the various factors which affect the wear of roller chains, and stated that to provide the expected life in common power transmission drives, the chain load rarely exceeds 10% of the single-load breaking strength of the chain.

From his description of special investigations undertaking to solve specific problems, it is clear that a high degree of metallurgical knowledge is often required to select the best materials, processing methods, heat treatments, and surface finishes for the parts of chain which are to operate under special service conditions, involving shock loads or corrosion.

In concluding his talk, Dr. Focke stressed the fact that the management of his company recognizes the importance of the activities of the local chapters of A.S.M. in helping to provide this metallurgical knowledge.

Tool Steel Division Formed

The Amalgamated Steel Corp. of Cleveland has formed a new tool steel division to be known as Malga Steel Service. The division is to have its headquarters in both Detroit and Cleveland, E. R. Dallas heading the Cleveland office and H. E. Zeeman ⊕, the Detroit.

National Metal Congress
Oct. 23-29, 1948
National Metal Exposition
Oct. 25-29, 1948
PHILADELPHIA, PA.

NATIONAL MEETINGS

for March

March 1-4—American Society of Mechanical Engineers. Spring Meeting, St. Charles Hotel, New Orleans, La. (Ernest Hartford, executive assistant secretary, A.S.M.E., 29 West 39th St., New York 18, N.Y.)

March 4-5—Purdue University. 19th Annual Welding Conference, Purdue University Campus, Lafayette, Ind. (W. A. Knapp, associate dean, Schools of Engineering, Purdue University, Lafayette, Ind.)

March 15-19—American Society of Tool Engineers. Sixth Annual Industrial Exposition, and Sixteenth Annual Meeting, Public Auditorium, Cleveland. (Harry E. Conrad, executive secretary, A.S.T.E., 1666 Penobscot Bldg., Detroit 26, Mich.)

March 18-19—Magnesium Association. Fourth Annual Meeting, Pennsylvania Hotel, New York City. (T. W. Atkins, executive vice-president, 30 Rockefeller Plaza, New York 20, N.Y.)

March 22-24—Chicago Technical Societies Council. Chicago Technical Conference and Production Show, Stevens Hotel, Chicago. (Paul A. Jenkins, executive secretary, C.T.S.C., 53 West Jackson Blvd., Chicago 4, Ill.)

24a-14. Stresses Near the End of a Long Cylindrical Shaft Under Nonuniform Pressure Loading. C. J. Tranter and J. W. Craggs. *Philosophical Magazine,* 7th Series, v. 38, March 1947, p. 214-225.

An analytical solution; its numerical applications; comparison with results obtained by approximate methods.

24a-15. The Theorem of Four Moments, With Applications in the Theory of Plane Structures. F. J. Turton. *Philosophical Magazine,* 7th Series, v. 38, April 1947, p. 251-267.

Deals only with plane structures. Some simple examples in which not more than two beams are rigidly joined at any one point. Determination of the end moments for the members of the rigidly jointed plane frame of a framed building and determination of the end moments required to find secondary stresses in a plane frame with rigid joints.

24a-16. Bending of Clamped Rectilinear Plates. B. R. Seth. *Philosophical Magazine,* 7th Series, v. 38, April 1947, p. 292-297.

In the bending of rectilinear plates with supported edges, solution can be made to depend on the corresponding torsion solution for the boundary when the plate is bent by uniform pressure. A simple solution has also been given for an equilateral plate. Solution for a rectangular plate which has been obtained in the form of a double Fourier's series now shows that the general case of a rectilinear plate can also be obtained in the form of a double series.

24a-17. Stress-Strain Compatibility in Greatly Deformed Engineering Metals. K. H. Swainger. *Philosophical Magazine,* 7th Series, v. 38, June 1947, p. 422-439.

A highly theoretical discussion covering physical bases; compatibility of displacement and "true" strain; stress-strain compatibility; isotropic inelastic metals with moduli which are a function of position and with constant moduli. 20 ref.

24a-18. How the Hopper Car Has Developed. George A. Suckfield. *Railway Age,* v. 124, Jan. 17, 1948, p. 41-44.

Nine examples show trends throughout the steel era. Experience with lightweight cars and the problem of weight reduction.

24a-19. Torsional Vibration Frequency. Frederic P. Porter. *Machine Design,* v. 20, Jan. 1948, p. 153-156. Based on paper presented to the S.A.E.

Charts and formulas for determining the above with sufficient accuracy for preliminary estimation.

24a-20. Die Casting Die Design. Part I. H. K. Barton and J. L. Erickson. *Tool & Die Journal,* v. 13, Jan. 1948, p. 48-51, 84-86.

Ejection from the die; method of ejection; ejector pins; methods of ejection other than by ejector pins; dimensioning the pin.

For additional annotations indexed in other sections, see:
27a-1-6-15-19-20.

24b — Ferrous

24b-1. Slitting Razor Blade Strip With Wimet. *Machinery* (London), v. 71, Nov. 20, 1947, p. 575.

Advantages and disadvantages of different designs of the fluted part. Shearing the edges of 6½-in. wide, high-carbon steel, razor-blade strip to 5¾ in. by means of Wimet slitting disks.

24b-2. Report of Committee 15—Iron and Steel Structures. *American Railway Engineering Association, Bulletin,* v. 49, Dec. 1947, p. 199-235.

Revisions of specifications for steel railway bridges; impact test results; specifications for fusion welding and gas cutting; design of expansion joints; stress distribution in bridge frames—floorbeam hangers; design of bridge details; shortening of eyebars to equalize the stress; specifications for cold-riveted construction.

24b-3. An Alternative Form of Pressure Vessel of Novel Laminar Construction. H. Birchall and G. F. Lake. *Institution of Mechanical Engineers, Proceedings,* v. 156, Dec. 1947, p. 349-358; discussion, p. 358-367.

Advantages of novel laminar design over forged construction, which must be produced as single forgings, where the limit in regard to ingot size has already been reached. Design, construction, and testing; costs and future possibilities.

24b-4. Flame Design Considerations. Harald E. Lonngren. *Petroleum Refiner,* v. 27, Jan. 1948, p. 69-73.

A graphical method for finding the stress distribution in a flange which has been strengthened by the addition of material to provide for anticipated metal loss through corrosion or erosion.

24b-5. Strain Gage Analysis of Mechanical Punch Presses. Given Brewer. *Iron Age,* v. 161, Jan. 15, 1948, p. 66-72.

Extensive dynamic and static tests, utilizing strain gages, on mechanical punch presses. Suggests design and construction improvements for greater efficiency and strength.

24b-6. Fatigue Failure of Press Fitted Members. *Engineer,* v. 184, Dec. 26, 1947, p. 600-601.

Critically reviews recent papers.

24b-7. A Clinical Approach to Weldment Design. Gerald Von Stroh. *Steel,* v. 122, Jan. 19, 1948, p. 68-72, 106.

Failures in large welded structures. Points out that a weldment is actually one piece of metal which may have notches and incipient cracks because of necessary or unnecessary design features. Various use factors introduce uncertainties into design calculations. Recommended design changes which should minimize chances for failure are illustrated by descriptions of actual structures which have failed. (From data presented at A.S.M.E. meeting, Atlantic City, N. J., Dec. 3, 1947.)

24b-8. The Magneto-Elastic Method for Measuring Deformations and Strains in Machine Parts. (In Russian.) D. I. Volkov. *Zavodskaya Laboratoriya (Factory Laboratory),* v. 13, Sept. 1947, p. 1063-1073.

After investigating different methods, it is concluded that the magnetostriction method (change of magnetic permeability of ferromagnetic materials under stress) is most convenient and exact. Theory and practical application of this method. 10 ref.

24b-9. Antifriction Bearings. Part 5. L. E Browne. *Steel,* v. 122, Jan. 12, 1948, p. 72-74 100.

Some typical instances in which ball bearings exert a strong influence on the design of high-speed industrial equipment.

For additional annotations indexed in other sections, see:
22b-9.

24c — Nonferrous

24c-1. Lubricants and Bearings for Turbines. F. C. Linn. *Lubrication Engineering,* v. 3, Dec. 1947, p. 71-75.

Lubricating systems used by General Electric. Viscosity requirements; recommended types of oil; selection of materials for, and design of, bearings.

24c-2. Designing Thoriated Tungsten Filaments. H. J. Dailey. *Electronics,* v. 21, Jan. 1948, p. 107-109.

Design data for carburized thoriated tungsten filaments are calculated using formulas applicable to filaments of pure tungsten. Procedure requires controlled carburization to give carburized and uncarburized filaments having similar electrical characteristics.

24d — Light Metals

24d-1. An Analysis of Simplified All-Metal Wing Structures. David J. Peery. *Aero Digest,* v. 56, Jan. 1948, p. 38-40, 104.

Stresses and strains in simplified vs. conventional forms.

25
STATISTICS

25a — General

25a-1. The Atom and Industry. David E. Lilienthal. *Iron Age,* v. 161, Jan. 1, 1948, p. 126-129.

What does atomic energy mean to the average business? Will it create new markets? Will it render obsolete present industrial equipment? How far away is the harnessing of nuclear energy for industrial purposes? Plans of the Commission for the development of nuclear energy over the next five years.

25a-2. The New Giant of the West. R. T. Reinhardt. *Iron Age,* v. 161, Jan. 1, 1948, p. 190-197.

Problems caused by the large recent expansion of primary aluminum plants, whose high power demands threaten to restrict expansion of industry in other directions.

25a-3. Prices and Production. H. W. Van Camp. *Iron Age,* v. 161, Jan 1, 1948, p. 236-238, 274, 278, 284, 286, 288, 290, 292, 294, 296, 298, 300, 302, 304, 306, 308.

Statistical section gives data for many years back, often for each month of the year. The period covered varies with the product.

25a-4. Prospects for 1948. W. J. Campbell. *Steel,* v. 122, Jan. 5, 1948, p. 118-123.

Economic prospects for the metal-working industries.

25a-5. Distribution. B. K. Price. *Steel,* v. 122, Jan. 5, 1948, p. 134-137.

Problem of development of a more efficient system for channeling steel and finished products as well as other materials from producer to consumer.

25a-6. Transportation Industries. E. F. Ross, A. H. Allen, and B. K. Price. *Steel,* v. 122, Jan. 5, 1948, p. 138-143.

Economic prospects for railroads, automobile manufacturers, aircraft manufacturers, and shipbuilding for 1948.

25a-7. Metalworking Machinery. Guy Hubbard. *Steel,* v. 122, Jan. 5, 1948, p. 144-145.

Year-end upswing in machine-tool business encourages builders to believe that 1948 sales will be over $300,000,000.

25a-8. Industrial Machinery and Equipment. Vance Bell. *Steel,* v. 122, Jan. 5, 1948, p. 146-149.

Economic prospects for 1948.

25a-9. Electrical Equipment. J. C. Sullivan. *Steel,* v. 122, Jan. 5, 1948, p. 150-151.

Economic prospects for manufacturers in 1948.

25a-10. Construction. L. E. Browne. *Steel,* v. 122, Jan. 5, 1948, p. 152-153.

Economic prospects for 1948.

25a-11. Containers. L. E. Browne. *Steel,* v. 122, Jan. 5, 1948, p. 154-155.

Economic prospects for manufacturers of metal containers in 1948.

25a-12. Agriculture. E. F. Ross. *Steel,* v. 122, Jan. 5, 1948, p. 156-157.

Economic prospects for the agricultural-implement manufacturer in 1948.

25a-13. Appliances. J. C. Sullivan. *Steel,* v. 122, Jan. 5, 1948, p. 158-159.

Economic prospects for manufacturers of home appliances in 1948.

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Spring Expert Gives Analyses Best Suited For High Temperatures

Reported by J. C. Selby
Metallurgical Department
Timken Roller Bearing Co.

Spring Expert F. P. Zimmerli, chief engineer of the Barnes-Gibson-Raymond Division of the Associated Spring Corp., was the principal speaker at the January meeting of the Canton-Massillon Chapter. Mr. Zimmerli received the Albert Sauveur Achievement award last fall for his basic research in the field of shot-peening to increase favorable stresses in the surface of metal parts. His work was done on springs, but other research workers have applied the principles he laid down to a multitude of applications.

Mr. Zimmerli discussed the materials and heat treatments used in the manufacture of springs. Applications of springs to medium and high-temperature problems and the methods of solving several such problems were detailed, mainly by using different analyses. Some of the materials used include high speed steel, Inconel, and several medium-alloy steels, such as S.A.E. 6150, S.A.E. 9260, and a recently introduced analysis corresponding to the S.A.E. 8600 series with 0.60% C. Another alloy which does not fall in any of the standard classifications has shown promise at higher temperatures, but Mr. Zimmerli stated that a better alloy is still needed for heavier springs.

The application of shot-peened springs at temperatures over 400° F. is not practical, for tests have shown that some advantages of shot-peening are lost above 400° F., and the springs set badly in use. At lower temperatures, however, shot-peening has been found very useful in bettering the normal endurance limits of medium springs.

In the discussion period following Mr. Zimmerli's talk, led by O. J. Horger, chapter chairman, Mr. Zimmerli revealed that X-ray diffraction tests are now in progress to determine the depth of metal which benefits from shot-peening.

Westinghouse to Award Ten Scholarships at Carnegie Tech

Announcements and application forms for the George Westinghouse scholarships at Carnegie Institute of Technology have been mailed to 24,000 secondary schools, according to Webster N. Jones, director of the College of Engineering and Science. The ten scholarships, valued at $2200 each, are awarded each spring to outstanding high school senior men in chemical, civil, electrical, management, mechanical or metallurgical engineering or in chemistry or physics. Providing $275 for each of eight semesters, the scholarships are sponsored by the Westinghouse Electric Corp.

Deaths Recorded of 3 Past Chairmen

Leo Carl Conradi, aged 57, died on Dec. 4 after an illness of nearly a year. Mr. Conradi had been director of research and development of the Standard Steel Spring Co. since 1942. He graduated in metallurgy from University of Michigan in 1914, and was associated with International Business Machines Corp. of Endicott, N. Y., for many years. He was a past chairman of the Southern Tier Chapter, and was also active in the Society of Automotive Engineers, American Society for Testing Materials, and American Electroplaters Society.

Lewis H. Knapp, who died Oct. 28, was chairman of the Hartford Chapter in 1933-34. He was commercial manager of the Hartford Electric Light Co., an organization he joined in 1927 as a power engineer, later serving as sales manager and then commercial manager. He was a graduate of Purdue University in 1906, and was formerly employed by General Electric Co. in Schenectady, N. Y.

Donald R. McAllister, president of the Syracuse Heat Treating Corp., died on Thanksgiving day. He was a past chairman of the Syracuse Chapter and a member of the Metal Treating Institute. A native of Syracuse, Mr. McAllister attended Carnegie Institute of Technology in Pittsburgh.

25a-14. Mr. Kaiser and Associates. *Modern Metals*, v. 3, Dec. 1947, p. 14-15.
Progress of the above individuals and their companies during 1947 in aluminum, automobiles, dishwashers, etc.

25a-15. Outlook and Present Trend of the Wire Industry. *Wire and Wire Products*, v. 23, Jan. 1948, p. 42-44, 97; discussion, p. 51, 54-55.
The State of the Industry in the Eastern Mills, by K. B. Lewis; Report on the Steel Wire Industry in the Middle West, by J. L. Schueler; Western States Wire and Wire Product Industry. Includes both technology and economics.

25a-16. Rejuvenating European Mining. Charles Will Wright. *Mining and Metallurgy*, v. 29, Jan. 1948, p. 12-15.
How the Marshall plan may help Europe's mines and mitigate U. S. shortages.

25b — Ferrous

25b-1. Arctic Iron Mines. Frank Illingworth. *Iron and Steel*, v. 20, Nov. 20, 1947, p. 556.
Swedish plans for expansion of output.

25b-2. Rhodesian Steel Scheme. *Iron and Steel*, v. 20, Nov. 20, 1947, p. 553-556.
New development will make a large contribution to solution of the world supply problem. Proximity of high-grade hematite, coal deposits, and hydro-electric potentialities make the prospects attractive for Britain.

25b-3. Brazilian Ore Resources and the Volta Redonda Plant. Part II. Ralph Vaill. *Blast Furnace and Steel Plant*, v. 35, Dec. 1947, p. 1488-1489, 1538.
Advantages of plant because of the superior quality of available raw materials. A rosy future is ahead for Brazilian steelmaking and ore export from this area, although at present more than 130,000 tons of steel are unsold and apparently unwanted.

25b-4. Geneva Steel. Walther Mathesius. *Western Metals*, v. 5, Dec. 1947, p. 25-27.
Present status and future prospects; lists of potential consumers.

25b-5. Steel at the Crossroads. Tom Campbell. *Iron Age*, v. 161, Jan. 1, 1948, p. 130-139.
Economic prospects, gray markets, demand, prices, competition. Results of a survey of 1850 large steel consumers concerning their relations with the various steel companies.

25b-6. Two Worlds and Steel. Jack Hight. *Iron Age*, v. 161, Jan. 1, 1948, p. 140-147.
Economic situation, present organization and status, and future prospects of the European steel industry. Effects of future American aid or the lack of it.

25b-7. The Steel Consumer; Rx—Aspirins, Ingenuity and Hope. D. I. Brown. *Iron Age*, v. 161, Jan. 1, 1948, p. 148-155.
Future prospects for steel supply and prices.

25b-8. Raw Materials Still a No. 1 Problem. W. A. Lloyd. *Iron Age*, v. 161, Jan. 1, 1948, p. 210-219.
The many facets of the iron ore picture: open-pit reserves, taconite concentration, development of deposits in Labrador and Brazil, the St. Lawrence waterway.

25b-9. The Basing Point System. G. F. Sullivan. *Iron Age*, v. 161, Jan. 1, 1948, p. 220-227.
Advantages of the multiple basing point system of steel pricing and marketing and future prospects for changes in it. Chart gives basing points of major steel products.

25b-10. The Steel Industry. B. K. Price. *Steel*, v. 122, Jan. 5, 1948, p. 124-129.
1948 prospects for additions to capacity; ore, coke, and scrap supplies; demand for various types of products; exports; wages; prices.

25b-11. Europe Drives for Recovery. Vincent Delport. *Steel*, v. 122, Jan. 5, 1948, p. 322-323.
Economic situation, especially in iron and steel.

25b-12. British Making Progress. J. A. Horton. *Steel*, v. 122, Jan. 5, 1948, p. 323-324.
Economic situation, especially in iron and steel.

25b-13. France—Belgium. Leon Jaudoin and Jacques Foulon. *Steel*, v. 122, Jan. 5, 1948, p. 324-325.
Economic situation, especially in iron and steel.

25b-14. Italy. Antonio Giordano. *Steel*, v. 122, Jan. 5, 1948, p. 325.
Economic situation, especially in iron and steel.

25b-15. There Is Plenty of Iron. John D. Greene. *Steelways*, Jan. 1948, p. 1-5.
Depletion of high-grade ores in the Mesaba. Prospects for beneficiation and for obtaining of high-grade ore from Laborador are promising.

25c — Nonferrous

25c-1. Economics of Die-Casting Die Construction. J. L. Erickson and H. K. Barton. *Machinery* (London), v. 71, Nov. 27, 1947, p. 606-609.

25c-2. Will There Be Sufficient Lead for U.S. Needs and What Will Be Probable Price? Andrew Fletcher. *Metals*, v. 18, Dec. 1947, p. 7, 9-11, 16.
Address delivered at meeting of Mining and Metallurgical Society of America, New York, Dec. 16, 1947.

25c-3. Taxing Metal Output and Exports in Mexico Prevents Development of Mining Industry. Gustavo P. Serrano. *Metals*, v. 18, Dec. 1947, p. 12-16.
Address delivered at convention of American Mining Congress, El Paso, Texas, Oct. 27-29, 1947.

25c-4. Nonferrous Tight Supplies and Higher Costs Forecast for '48. John Anthony. *Iron Age*, v. 161, Jan. 1, 1948, p. 228-235.
Recent trends and future prospects.

25c-5. Nonferrous Metals. F. R. Briggs. *Steel*, v. 122, Jan. 5, 1948, p. 130-133.
Economic prospects for 1948.

25d — Light Metals

25d-1. Buyers' Directory for All Forms of Light Metals, Fabricators, Related Products and Equipment. *Modern Metals*, v. 3, Dec. 1947, p. 28-31.

26
MISCELLANEOUS

26a — General

26a-1. The Place of the Metallurgist in Industry. Arthur Smout. *Metallurgia*, v. 37, Nov. 1947, p. 7-10.
Condensed from an address delivered Nov. 19, 1947, to a combined meeting of technical societies.

26a-2. Metallurgy and Atomic Energy. C. Hubert Plant. *Metallurgia*, v. 37, Nov. 1947, p. 15-19.
Basic principles of atomic structure. (To be continued.)

26a-3. Facilities and Activities in Metallurgical Research. Mars G. Fontana. *Engineering Experiment Station News* (Ohio State University), v. 19, Dec. 1947, p. 3-4.
Facilities at Ohio State.

26a-4. Institute for the Study of Metals, the University of Chicago. Cyril Stanley Smith. *Scientific Monthly*, v. 65, Dec. 1947, p. 489-492.
The new institute is to be devoted to fundamental rather than applied metallurgical research.

26a-5. Metallurgy Research Drives to Meet New Economic Needs. E. S. Kopecki. *Iron Age*, v. 161, Jan. 1, 1948, p. 198-207.
Important developments of 1947 and important research now in progress.

26a-6. Washington. Eugene J. Hardy. *Iron Age*, v. 161, Jan. 1, 1948, p. 244, 246.
New metallurgical research programs now planned by the military.

26a-7. Metallurgy. *Steel*, v. 122, Jan. 5, 1948, p. 190-193.
Brief reviews of new developments: Graphitization Resistance Aided by Alloys in C-Mo Steels, by J. W. Bolton; Substructural Imperfections Identified With Fractography, by Carl A. Zapffe; Electrodeposited Alloys Improve Bearing Material Properties, by L. A. Barera; Beryllium Copper Useful in Heavy Gage Applications, by H. G. Williams; Forecasts Powder Metallurgy Improvement in Coming Year, by A. J. Langhammer; Isothermal Quenching Broadens Scope of Heat Treatment, by Orlo E. Brown; New Rolling Capacity for Superalloys Imminent, by C. G. Chisholm; Use of Recent Developments Helps Meet Stiff Competition, by J. A. Scully; Materials Substitutions to Continue During 1948, by J. T. Jarman; 1947 Viewed as Theory Year Offering Future Potentialities, by R. H. Harrington; Notch Sensitivity of Plate Steel Actively Studied, by Samuel Epstein; Less Attention to Composition, More to Hardenability of Steels, by Howard E. Boyer; Metallurgist Can Offer Aid to the Design Engineer, by Arnold P. Seasholtz; Higher Speeds Demand Better Bearing Qualities, by Joseph J. Mayer; Sees Increase in Basic Metallurgical Knowledge, by A. S. Jameson; Rolled Isotopes for Shielding Sources of Nuclear Energy, by Arthur E. Focke.

26a-8. Lubrication. *Steel*, v. 122, Jan. 5, 1948, p. 243-244, 246.
Brief reports on recent developments: Mounting of Roller Bearings Aided by Oil Injection Method, by A. Stewart Murray; Prelubricated Sealed Bearings Run Nine Years Without Regreasing, by D. E. Batesole; Trend Toward Use of Water Soluble Coolants Is Noted, by A. E. Carpenter; Open Gear Lubrication Presents Difficult Problems, by Joseph A. Rigby; Uniform Lubricating Systems Best Management Investment, by E. J. Ehret; Suggests Key to Modern Industrial Lubrication, by James G. O'Neill, Jr.; Stresses Importance of Oil Purification Equipment, by B. F. Hunter; Improved Quenching Oil Offers Maximum Hardness, Less Distortion, by E. L. H. Bastian; Use of Nonsoap Greases Increasing in Metalworking, by Clifford C. Goehring.

26a-9. High-Temperature Greases. H. A. McConville. *Product Engineering*, v. 19, Jan. 1948, p. 93-95.
Factors which should be considered in selection and application.

26a-10. The Passage of Liquid Conductors Through Minute Orifices in Dielectrics. M. V. Griffith and A. Morris Thomas. *Philosophical Magazine*, 7th Series, v. 38, Feb. 1947, p. 81-96.
Mercury will pass through a small hole or puncture produced electrically or mechanically in a dielectric partition separating the mercury from a semi-conducting liquid medium under the action of an applied voltage. A theory for this phenomenon. A similar action occurs with conducting liquids (for instance, water) if they are immiscible with the medium. It is believed that any liquid would act similarly and that metals, for example, might be obtained in the form of a colloidal dispersion by use of a quartz capillary tube at temperatures higher than the fusing point of the metal if a suitable liquid medium were available.

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Wilhelm Explains Production and Uses Of Atomic Energy

Reported by Henry Hauseman
Metallurgist, LaPlant Choate Mfg. Co.

H. A. Wilhelm, associate director, Atomic Research Institute, Iowa State College, addressed his home chapter in Cedar Rapids for the first time on Jan. 13. Dr. Wilhelm entered the Atomic Energy Project at Ames, Iowa, in 1942, and is in direct charge of the metallurgy division that developed the large-scale process for producing uranium.

Dr. Wilhelm gave a brief description of the physical properties of uranium, thorium and beryllium, and pointed out the functions of these materials in the production of plutonium, uranium^{235} and uranium^{233} for the atomic energy program. Metal samples of uranium, thorium and beryllium were exhibited by the speaker.

The involved subject of atomic fission was presented in a novel and understandable manner. Excellent slides helped to impart an elementary working knowledge of the subject, as well as to illustrate the basic principles of the atomic furnace or pile, how it is operated and controlled.

Since the cost of fuel is only a small part of the cost of generating, supplying and distributing electrical energy, Dr. Wilhelm does not expect to see modern fuels replaced by atomic energy (with its problems of radioactive byproducts) for some years. He feels, however, that under certain conditions, where it is necessary to establish plants for the production of electrical energy or power in areas lacking normal fuels, or where the transportation of such fuels is economically unsound or physically impossible, atomic power plants would find considerable favor. He mentioned battleships, submarines, and aircraft as among the probable first users of atomic energy.

The climax of Dr. Wilhelm's talk was reached when he described the byproducts of atomic energy: radioactive materials used as tracers in studying the assimilation of the chemical elements by organic life; the affinity of radioactive phosphorus for cancerous tissue; the introduction of radioactive iodine into the human body for treatment of cancer of the thyroid gland. Some radioactive elements appear to be more effective than radium and may entirely replace radium in the treatment of certain cancerous conditions. Thus, vistas in cancer therapy have been opened which hold great promise in overcoming this dread disease.

The possibility of discovering how nature can take carbon dioxide and water and make sugar—a chemical reaction we cannot perform in the laboratory—by introducing radioactive carbon to plant life and tracing its path and reactions, shows that the chemist is on the threshold of more thrilling discoveries than he has experienced in the past.

Dr. Wilhelm concluded by stating that the world must find a way to control atomic energy, and then use it for the benefit of all mankind.

Welding Program Released

A program entitled "More Power to America" and designed to show how increased use of electric arc welding in industry can reduce manufacturing costs and produce better products has been released by the General Electric Co. Showings of the program are being given by local electric utilities and G. E. welding distributors.

The program features an all-color sound movie, "Arc Welding at Work", which illustrates 53 outstanding electric welding applications photographed in the plants of metal fabricators and manufacturers. It shows the latest developments in metal-arc, atomic-hydrogen, and Inert-Arc welding, both manual and automatic. Besides the film, the new program is made up of an application manual, "Electric Arc Welding," and a handout bulletin, "Cut Costs and Improve Quality With Electric Arc Welding."

26a-11. Electrical and Allied Developments During 1947. Guy Bartlett. *General Electric Review,* v. 51, Jan. 1948, p. 11-53.

Covers a wide variety of fields including atomic power; supersonic flight; germanium; ceramics; welding; testing and measuring instruments; electronics; power generation, transmission, and distribution; motors; industrial heating; mining; iron and steel; lumber and paper; printing; textiles; rubber; plastics; food industries; lighting; air conditioning; home appliances; metallurgy; transportation; and others.

26a-12. Who Sells It. The Iron Age Metalworking Buyers' Guide. A. D. Stout, Jr., and T. S. Blair. *Iron Age,* v. 161, Jan. 1, 1948, p. 208-209, 310, 312-328; Jan. 8, 1948, p. 106, 108, 110; Jan. 15, 1948, p. 87-88, 129-130.

Directory lists companies and addresses under products, which are listed alphabetically. (To be continued.)

26a-13. What to Look for in Hydraulic Oils. Part V. Oxidation Stability. Part VI. Lubricating Value. Anthony J. Zino, Jr. *American Machinist,* v. 92, Jan. 1, 1948, p. 96-99; Jan. 15, 1948, p. 97-100.

Part V points out that excessive heat or presence of contaminants will change an oil's properties and give rise to erratic operation or damage to hydraulic mechanisms. Part VI points out the necessity for oiliness or lubricating value, although the primary purpose of the fluid is to transmit motion. Effects of poor lubricant properties on metal parts of hydraulic systems; test machines for evaluating the oils. (To be continued.)

For additional annotations indexed in other sections, see: 12a-4.

26b — Ferrous

26b-1. Iron and Steel Research. *Iron and Steel,* v. 20, Nov. 20, 1947, p. 543-546.

British Iron and Steel Research Association facilities and activities.

26b-2. Some Modern Aspects of Steel Plant Lubrication. C. E. Pritchard. *Lubrication Engineering,* v. 3, Dec. 1947, p. 64-68.

A general discussion.

26c — Nonferrous

26c-1. Rare and Minor Metals; Survey of the Progress Made by German Investigators. *Metal Industry,* v. 71, Dec. 12, 1947, p. 483-485.

Condensed from recent B.I.O.S. report.

26d — Light Metals

26d-1. Western Metals Forum. *Western Metals,* v. 5, Dec. 1947, p. 31-33.

The question: "What can be done to increase use and usefulness so as to help make magnesium a metal of today?" is discussed by A. C. Byrns, Edmund T. Price, Ivan Bloch, E. B. Parker, Leo B. Grant, and N. H. Engle.

27
NEW BOOKS

27a — General

27a-1. Design of Machine Members. Ed. 2. Alex. Vallance and Venton L. Doughtie. 559 pages. McGraw-Hill Book Co., 330 W. 42nd St., New York. $4.50.

A thorough reference work on the design of machine elements, from welded and riveted joints to bearings and gears. Numerous changes and revisions have been made and some chapters have been largely rewritten. Includes numerous typical problems.

27a-2. Dictionary of Machine Shop Terms. A. C. Tolford. 292 pages. 1947. American Technical Society, Chicago, Ill. $0.75.

All the terms with which a mechanic should be familiar in order to pursue his trade effectively. A number of words and terms not directly related to shop work are included for their value in general use.

27a-3. Metallurgy for Aircraft Engineers, Inspectors and Engineering Students. R. A. Beaumont. 273 pages. 1946. Sir Isaac Pitman & Sons, Ltd., Parker St., Kingsway, London, England.

Deals chiefly with alloy structural steels, casehardening steels, light alloys, and copper and its alloys, which are used in aircraft construction. The production of steel, mechanical methods of working steel, steel composition, structure, and heat treatment, defective materials and processes, mechanical testing, and temperature measurement equipment. Tables of specifications are included.

27a-4. Proceedings Third Annual Spring Meeting of Metal Powder Association. 70 pages. Metal Powder Association, 420 Lexington Ave., New York 17, N. Y. $2.50.

Subjects covered are stainless steel powder, new developments in production of powder-metal parts (at Ford); cost calculations; and a panel discussion on: apparatus for air classification of metal powders; bearings, bushings and allied products; copper-lead bearings from metal powder; electrical components from metal powders; and metal powders as pigments.

27a-5. The Story of Scrap. Edwin C. Barringer. 152 pages. Institute of Scrap Iron & Steel, Inc., 1536 Connecticut Ave., N.W., Washington 6, D. C. $2.75.

The basic facts of the scrap industry coupled with a semitechnical description of the leading scrap-consuming processes. Development of the scrap industry; the source of scrap and the role of dealers and brokers; statistics and specifications for the various grades of scrap.

27a-6. Tests With Circular Plates. (In English.) Ake Holmberg. 118 pages. 1946. Generalstabens Litografiska Anstalts Forlag, Stockholm, Sweden. (Royal Swedish Academy of Engineering Sciences, Proceedings No. 190.)

A method for empirically determining moment distribution in plates or other structural elements which are difficult to treat mathematically, e.g., shells. Application of this method to circular plates in some particular cases of load. Details of the apparatus used and results obtained with steel plates. Nomographs correlate average test data.

27a-7. Powder Metallurgy. Paul Schwarzkopf. 379 pages. 1947. Macmillan Co., 60 Fifth Ave., New York 11, N. Y.

The revised workbook and notebook of a successful powder metallurgist is divided into four sections: processing, products, theoretical principles, and future developments, each followed by a bibliography. The book is said to have been written under the unusual circumstances of complete freedom to disclose information obtained during 30 years' work in the field. 454 ref.

27a-8. Corrosion of Metals With Oxygen Depolarization. N. D. Tomashoff. 258 pages. 1947. Academy of Sciences, Institute of Physical Chemistry of the U.S.S.R., Moscow and Leningrad.

In addition to a theoretical analysis of general problems of electrochemical corrosion, the author gives an exhaustive treatment of corrosion processes that occur with oxygen depolarization. Emphasizes the theory and experimental study of cathodic processes.

27a-9. Sandvikens Handbook. Del 12. Svetsning. (Sandviken's Manual No. 12. Welding.) K. A. Ringdahl. 124 pages. Sandvikens Jernverks Aktiebolag, Sandviken, Sweden. 2.50 Kr.

A comprehensive survey of the principles of the various welding processes and the types of equipment used in Sweden. Chapters include the various forms of arc welding and gas welding; the more recent forms of gas and arc welding such as atomic hydrogen and Argonarc; resistance welding with examples of the different types of equipment and their particular applications. Includes a brief outline of the fundamentals of welding metallurgy, gas cutting and various methods of brazing. Lists of Swedish welding standards, welding organizations, literature available, and a short glossary.

27a-10. A.S.M.E. Boiler Construction Code. Section II. Material Specifications. 544 pages. 1946. American Society of Mechanical Engineers, 29 W. 39th St., New York.

27a-11. DoAll Contour Saws. Ed. 12. 416 pages. The DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill. Free to those requesting on company letterhead.

Revised and enlarged in order to include a new section on instruction programs for use in a shop or school training course. The techniques for contour sawing and filing, as well as high-speed sawing and friction-cutting methods with band-sawing equipment. Compares the performance of these machines with other basic machine tools. Contour saw and file applications.

27a-12. Bibliography on Nickel Compounds in Refractories; 1927-1946. 5 pages. July 1947. Industrial Chemicals Section, Development and Research Department, International Nickel Co., Inc., 67 Wall St., New York 5, N. Y.

Consists of 14 abstracts plus author and chronological indexes.

27a-13. Illustrated Jig-Tooling Dictionary. T. G. Thompson and R. A. Peterson. 349 pages. 1947. Macmillan Co., 60 Fifth Avenue, New York, N. Y. $7.50.

Basic fundamentals of tooling. Definitions of terms used with tables of decimal equivalents, trigonometric functions, cutting speeds and like information.

27a-14. Nomography. Alexander S. Levens. 176 pages. January 1948. John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. $3.00.

Theory and construction of charts involving straightline scales, curved scales and combinations of these. How to use these charts in various technical fields.

27a-15. Elementary Mechanical Vibrations. Austin H. Church. Pitman Publishing Corp., 2 West 45th St., New York 19, N. Y.

Basic principles required for solution and understanding of vibration problems.

27a-16. Engineering Organization and Methods. James E. Thompson. 227 pages. McGraw-Hill Book Co., Inc., 330 West 42nd St., New York 18, N. Y. $4.00.

How to administer an engineering department well.

27a-17. A Method of Semiquantitative Spectrographic Analysis. C. E. Harvey. 285 pages. 1947. Applied Research Laboratories, Glendale, Calif. $10.00.

Method requiring no prepared standards provides approximate quantitative analyses of most elements which can be detected spectrographically in the d.c. arc source. 258 pages of tables covering the elements investigated.

27a-18. Industrial Experimentation. K. A. Brownlee. 116 pages. 1947. Chemical Publishing Co., Inc., 26 Court Street, Brooklyn 2, N. Y. $3.75.

Statistical methods for pilot-plant and plant-scale experiments on chemical manufacturing processes.

27a-19. The Boilermaker's Assistant.

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CHAPTER MEETING CALENDAR

CHAPTER	DATE	PLACE	SPEAKER	SUBJECT
Akron	Mar. 10	Elks Club	H. P. Croft	Nonferrous Metals—Copper, Nickel, etc.
Baltimore	Mar. 26	Engineers Club	L. W. Eastwood	
Boston	Mar. 5	Hotel Sheraton	B. F. Shepherd	Hardenability of Shallow Hardening Steels Determined by the PV Test
Buffalo	Mar. 11	Hotel Statler	C. R. Austin	Metallurgy, Properties and Engineering Applications of Iron Castings
Calumet	Mar. 9	Phil Smidt & Sons, Hammond, Ind.	George C. Ensign	Mainspring Miracle—the Story of Elgiloy
Canton-Massillon	Mar. 8	Mergus Restaurant	Alexander Feild	Stainless Steels
Cedar Rapids	Mar. 9	Hotel Roosevelt	H. W. McQuaid	Metallurgical Factors in Processing Steel
Chicago	Mar. 8	Furniture Mart Club Rooms	Robert F. Mehl	A Century of Metallurgy—The Development of Physical Metallurgy
Cincinnati	Mar. 11	Engineering Society	H. J. Babcock	Salt Bath Heat Treatment
Cleveland	Mar. 1	Cleveland Club	Spencer Irwin	The Temper of Europe
Columbus	Mar. 9	Ft. Hayes Hotel	R. G. Kennedy, Jr.	Some Metallurgical Aspects of Small Tool Manufacturing
Dayton	Mar. 10	Miami Hotel	Herman L. Smith	Bearings and Bearing Metals
Des Moines	Mar. 9		Sam A. Higginbottom	Finishing of Metallic Emblems
Detroit	Mar. 8	Engineering Society of Detroit	Robert H. Aborn	Martensite and Martempering
Fort Wayne	Mar. 8	Fort Wayne Chamber of Commerce	Clarence Lorig	Applications of Alloy Cast Iron
Georgia	Mar. 5	Atlantic Steel Co., Atlanta	Herman A. Dickert	Metals for the Textile Industry
Hartford	Mar. 9	Hartford State Trade School	A. K. Phillippi	Furnace Atmospheres Used During Brazing
Indianapolis	Mar. 15	Marott Hotel	C. P. Larrabee	Corrosion of Metals—Particularly High-Strength Low-Alloy Steels
Lehigh Valley	Mar. 5	Hotel Traylor, Allentown, Pa.	C. T. Evans	Heat Resisting Alloys for Gas Turbines
Los Alamos	Mar. 1		Al Bates	
Los Alamos	Mar. 9		Frank T. Chesnut	
Los Angeles	Mar. 9	Roger Young Auditorium	F. B. Foley	Alloys for Elevated Temperature Service
Louisville	Mar. 2	Preston J. Kunz Restaurant	John N. Ludwig, Jr.	Controls and Foundry Methods in Production of Plain and Alloy Cast Irons
Mahoning Valley	Mar. 16	V.F.W. Rooms	R. W. E. Leiter	Deep Drawing of Automobile Steels
Milwaukee	Mar. 16	City Club of Milwaukee	Herman Smith	White Metals in Bearings and Other Applications
Montreal	Mar. 1	Queen's Hotel		Ladies' Night
Muncie	Mar. 16	Muncie Central High School	Raymond Wirt	Welding
New Haven	Mar. 18	Conn. Light & Power Co. Auditorium, Waterbury	Frederic O. Hess	High-Speed Annealing and Heat Treating of Ferrous and Nonferrous Products
New Jersey	Mar. 15	Essex House, Newark	Peter Payson	Tool and Die Steels
New York	Mar. 8	Building Trades Club	N. A. Kahn and E. A. Imbembo	Failure of Metals: Evaluating Transition From Shear to Cleavage Fracture
North Texas	Mar. 4		F. B. Foley	
Notre Dame	Mar. 10	Engineering Auditorium, University of Notre Dame	Charles Lipson	Factors of Stress and Strength
Northwest	Mar. 18	Covered Wagon, Minneapolis	W. H. Kemper	Plastic Mold Steels
Northwest Pa.	Mar. 25	Corry, Pa.	Oscar Frohman	Uses and Properties of Bronzes and Copper-Base Alloys
Ontario	Mar. 5	Royal York Hotel, Toronto		Ladies' Night
Ottawa Valley	Mar. 2	Bureau of Mines	J. D. Hanawalt	Recent Developments in the Uses of Magnesium
Penn State	Mar. 9	Mineral Industries Bldg.	R. F. Miller	High-Temperature Alloys
Philadelphia	Mar. 19	Franklin Institute	E. S. Davenport	Isothermal Transformation in Steel
Pittsburgh	Mar. 11	Mellon Institute Auditorium	R. L. Templin	Mechanical Testing of Metals
Pueblo	Mar. 18	Minnequa Club	Walter Orr Roberts	Climax High Altitude Laboratory
Rochester	Mar. 8	Lower Strong Auditorium	H. H. Harris	
Rocky Mountain	Mar. 19	Oxford Hotel, Denver	Walter Orr Roberts	Climax High Altitude Laboratory
Rome	Mar. 1		E. E. Thum	Atomic Energy and Its Implications
Saginaw Valley	Mar. 16		S. G. Fletcher	Surface Treatment of Toolsteel
San Diego	Mar. 16	Chadwick's Restaurant	Russell Steenrod	Electronic Industrial Heating
Southern Tier	Mar. 8	Mark Twain Hotel, Elmira, N. Y.	R. G. McElwee	Gray Cast Iron
Springfield	Mar. 15	Hotel Sheraton	James McElgin	Quenching
St. Louis	Mar. 19	Hotel York	Earl Bastian	Quenching of Toolsteels
Syracuse	Mar. 2	Onondaga Hotel	E. E. Thum	Philosophical Metallurgy
Terre Haute	Mar. 8	Indiana State Teachers' College Student Union	Arthur F. Underwood	Bearing Testing and Application of Bearing Metals
Texas	Mar. 2	Ben Milam Hotel	Francis B. Foley	Heavy Forgings
Toledo	Mar. 25	Maumee River Yacht Club	Clair Upthegrove	Ferrous Metallography
Tri-City	Mar. 2	Rock Island Arsenal Cafeteria	Ross Robinson	The Working of Metals
Tulsa	Mar. 9	Spartans Cafeteria	A. E. Focke	The Metallurgist, the A.S.M., and the Metals Industry
Washington	Mar. 8	Dodge Hotel, Garden House	O. C. Ralston	Strategic Metals and Some Possible Replacements
Western Ontario	Mar. 12		G. D. Fry	Die Casting
Wichita	Mar. 16		A. E. Focke	The Metallurgist, the A.S.M., and the Metals Industry
Worcester	Mar. 10	Empire Room, Putnam & Thurson's		Grinding Symposium
York	Mar. 10	Lancaster, Pa.	Carl Zapffe	Hydrogen Embrittlement

John Courtney. 108 pages. Technical Press, Ltd., Gloucester Road, Kingston Hill, Surrey, England. 5s.

Design of plate work for various types of tanks, boilers, and appropriate fittings, including the construction of templets. Design of boilers and the materials of construction.

27a-20. The Experimental Study of Structures. A. J. S. Pippard. 114 pages. 1947. Edward Arnold & Co. London, England. 9s.

Addressed to teachers and based on a short course of lectures and experiments. The principal elastic theorems and methods of stress analysis are summarized, and the most important section deals with the application of Clerk Maxwell's reciprocal theorem. Other chapters cover strain energy and distribution methods, experimental study of arches and a short description of experiments with sand.

27a-21. How to Run a Lathe. Ed. 45. 128 pages. South Bend Lathe Works, 383 E. Madison St., South Bend 22, Ind. Paper-bound, 25c; leatherette-bound, $1.00.

Operation of the lathe units; grinding cutter bits; making accurate measurements; plain turning; chuck work; taper turning; boring; drilling; reaming; tapping; and cutting screw threads.

27b — Ferrous

27b-1. Bibliography on the Effect of Nickel and Cobalt Oxides on Ground-Coat Enamels; 1927-1946. 19 pages. July 1947. Industrial Chemicals Section, Development and Research Department, International Nickel Co., Inc., 67 Wall St., New York 5, N. Y.

Presents 83 abstracts taken from *Chemical Abstracts* and arranged alphabetically by first author. Includes a co-author index.

27b-2. Steel Castings. Eric N. Simons. 216 pages. 1947. Chemical Publishing Co., Inc. Brooklyn 2, N. Y. $5.00.

Principles and practice from raw material to finished product.

27b-3. Steel and Its Heat Treatment. Ed. 5. Staff of Battelle Memorial Institute. John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Vol. I, $6.00; Vol. II, $4.00.

Principles underlying various types of heat treatment of carbon and alloy steel. Fundamental concepts, definitions and terminology in heat treatment. Volume II deals with the practical aspects of heat treatment, such as prevention of cracking and distortion, preparation of steel for machining and relation of heat treatment to welding.

27b-4. Industrial Radiographic Standards for Steel Castings. Two sets. 31 plates each. American Society for Testing Materials, 1916 Race Street, Philadelphia 3, Pa. $30.00 a set, or $55.00 for the two sets.

Reference standards developed by the United States Navy will assist in classifying defects revealed in castings by radiographic inspection. First set comprise X-ray standards and the second gamma-ray standards.

27b-5. New Developments in Ferromagnetic Materials. J. L. Snoek. 136 pages. Elsevier Publishing Co., Inc., 215 Fourth Ave., New York 3, N. Y. $2.50.

Progress made in Holland in research in ferromagnetic materials during the war.

27b-6. Cubicles and Control Desks (Mechanical World Monograph No. 36). F. T. Bennell. 50 pages. Emmott & Co., Ltd., 31 King Street West, Manchester 3, England. 2s. 6d. net.

Steel housings for electrical equipment. Explains the reasons underlying the use of various designs and manufacturing methods.

27b-7. Iron Simply Explained. Eric N. Simons. 203 pages. Paul Elek, 38 Hatton Garden, London.

Comprehensive information about iron in all its aspects from the mining of the ore to the finished product. Chapters on the structure, manufacture, heat treatment, and welding of the various types of iron.

27c — Nonferrous

27c-1. Nonferrous Melting Practice. American Institute of Mining and Metallurgical Engineers. 29 West 39th St., New York 18, N. Y $2.25 for members, $3.50 for nonmembers.

Manufacture and fabrication of the principal nonferrous metals. Measurement and Control of Temperatures in Smelting, Refining and Melting Nonferrous Metals, by P. H. Dike and M. J. Bradley; Melting Brass and Bronze in the Foundry, by H. M. St. John; Melting and Alloying of Wrought Copper Alloys, by R. S. Pratt; Melting of Nickel, by W. A. Mudge; Melting and Refining Practices for Magnesium, by Charles E. Nelson; Melting of Aluminum, by T. W. Bossert and H. J. Rowe; Melting of Lead and Tin, by A. J. Phillips. (Part of the Institute of Metals Division Symposium Series.)

27d — Light Metals

27d-1. Aluminum, From Mine to Sky. June Metcalfe. 128 pages. 1947. Whittlesey House, McGraw-Hill Book Co., 330 W. 42nd St., New York. $2.50.

Summary of the metal "from mine to finished product" in elementary language.

27d-2. Production of Metallurgical Alumina From Pennsylvania Nodular Diaspore Clays. J. E. Conley, R. A. Brown, F. J. Cservenyak, R. C. Anderberg, H. J. Kandiner, and S. J. Green. 193 pages. 1947. U. S. Government Printing Office, Washington. (Bureau of Mines Bulletin 465.)

Details of an extensive laboratory and pilot-plant investigation of all the factors involved in the above, including economics of the process. The principal step of the method studied comprises sintering with limestone and soda ash to convert the alumina to a water-soluble form and the silica to compounds insoluble in water or dilute alkalies. Other steps in the proposed flow sheet are: grinding, extraction, carbonation, and calcining. Results show that 87 to 90% of the Al_2O_3 can be recovered in a quality suitable for electrolysis. 73 ref.

Crucible Opens New Warehouse

Opening of a new warehouse in Philadelphia by Crucible Steel Co. of America brings to 23 the number of steel distribution centers maintained by the company throughout the country. The combination of location, new storage arrangements and mechanized handling has cut delivery time by 50%, according to C. H. Stoeckle ⚙, Philadelphia branch manager for Crucible.

Two New Foundries Opened

American Brake Shoe Co. has opened two new nonferrous foundries at Niles, Ohio, and Meadville, Pa. The Meadville plant will produce bronze bearings and castings. It will specialize in copper, brass and bronze for railroads, steel mills, and many other industries. The new foundry at Niles will manufacture railroad journal bearings.

1/4-Scale Die Design for New Auto Bodies Described

Reported by W. R. Jackson
Carboloy Division
Canadian General Electric Co., Ltd.

The necessity for teamwork in the design, metallurgical and forming departments in order to produce good products economically was stressed by N. E. Rothenthaler, superintendent of production and planning, steel operations, Ford Motor Co., addressing the Ontario Chapter ⚙ in Hamilton on Dec. 5 on "Sheet Metal Drawing and Stamping".

After describing the methods used for controlling deep drawing and forming operations, Mr. Rothenthaler detailed the method of design and construction of dies for new body parts. The experimental dies are made one-quarter scale for approximately one-tenth the cost of full size dies. New development dies for small stampings are made from a soft alloy of lead, tin and bismuth; six to ten stampings can be obtained after chilling the die to −320° F. in liquid nitrogen.

The technical chairman, Eric Caunce, chief metallurgist, Ford Motor Co. of Canada, introduced Mr. Rothenthaler.

ADVERTISERS INDEX

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EMPLOYMENT SERVICE BUREAU

The Employment Service Bureau is operated as a service to members of the American Society for Metals and no charge is made for advertising insertions. The "Positions Wanted" column, however, is restricted to members in good standing of the A.S.M. Ads are limited to 50 words and only one insertion of any one ad will be printed. Address answers care of A.S.M., 7301 Euclid Ave., Cleveland 3, Ohio, unless otherwise stated.

POSITIONS OPEN

East

SALES REPRESENTATIVE: For commercial heat treating concern in New York area. Knowledge of met. and all phases of heat treating desirable. Box 2-5.

RESEARCH METALLURGIST: With some exp in alloy steels, to work in research lab. of a large mfr. of complete range of alloy steels. State age, marital status, education, exp., and salary expected. Box 2-10.

INSTRUCTOR: In phys. met. in mechanical eng. dept. Some lab. work. Will teach mech. and chem. engineers. Salary $2600 for 9 months. Box 2-15.

RESEARCH ENGINEERS: Two project engineers required by a New York state university for research in behavior of materials and structures under dynamic forces. Work includes development and use of new testing machines, interpreting experimental data and reporting research. Ph.D. or M.S. desirable. Box 2-20.

METALLURGIST OR METALLURGICAL ENGINEER: With M.S. or Ph.D. to join staff of a young academic research institute connected with a large eastern university. Time to be divided between research and teaching grad. courses in met. Must possess outstanding ability in research and teaching exp. Reply to this ad must include complete academic record, publications, exp. in industrial research and in teaching, and salary desired. Attach nonreturnable small photo. Box 2-25.

RESEARCH FELLOWSHIP: In met. at eastern university. Post-grad. work for M.S. or Ph.D. Stipend $100 per month single or $150 per month married, plus tuition and fees. Start September 1948. Applications accepted until April 1, 1948. Selection of research problem in variety of fields including welding, induction heating, corrosion, powder met., and electromet. Box 2-30.

RESEARCH ASSISTANT: For research lab of steel mill producing wide variety of products. Applied research and development work will include experimental high-frequency melting, elevated temperature creep and stress-rupture testing as well as usual laboratory duties. Recent grad. or some lab. exp. desired. Box 2-150.

Midwest

TEACHER OF METALLURGICAL ENGINEERING: A large midwestern university desires to add another permanent teacher of met. eng. to its staff next fall. Post-grad. degrees and teaching exp. not essential although desirable. In first letter state personal history, education, exp., and salary expected. Box 2-35.

METALLURGISTS: Ferrous and nonferrous metallurgists for development and application work in electrical mfg. field. Unusual aptitude for original work required, coupled with mental alertness and high order of initiative. Address Manager, Technical Employment, Westinghouse Electric Corp., 306 Fourth Ave., Pittsburgh 30, Pa.

RESEARCH METALLURGISTS: Young men with good academic records and interest in research in any phase of metallurgy are invited to consider employment possibilities in the attractive Battelle research lab. Opportunities for professional growth, individual initiative, and advancement are limited only by the capabilities of the individual. All inquiries promptly acknowledged and treated confidentially. Please address replies directly to Battelle Memorial Institute, 505 King Ave., Columbus 1, Ohio.

GRADUATE METALLURGICAL ENGINEER: To do lab. research work improving product and processes in metalworking plant. Sound background in mechanics desirable. Should have several years industrial exp. Box 2-40.

RADIOCHEMIST OR RADIOPHYSICIST: For fundamental, publishable research employing radioactive tracers, in met. and phys. chem. Excellent opportunity for young scientist to gain exp. and reputation. Give full qualifications, exp. and salary requirements in letter addressed to Metals Research Laboratory, Carnegie Institute of Technology, Pittsburgh 13, Pa.

POWDER METALLURGIST: Exp. For work on both fundamental and applied research problems. Should be able to initiate and carry out over-all research program. Salary and position commensurate with background and exp. Metals Research Dept., Armour Research Foundation, Chicago 16, Ill.

NONFERROUS METALLURGIST: Excellent opportunity for grad. metallurgist exp. in general nonferrous problems. Should be able to initiate and carry out over-all research program. Salary and position commensurate with background and exp. Metals Research Dept., Armour Research Foundation, Chicago 16, Ill.

West

OPENINGS AT LOS ALAMOS SCIENTIFIC LABORATORY: For metallurgists for metal fabrication development. Requirements: bachelor's degree in met. eng. or mech. eng. plus two to 3 yr. exp. with metal fabrication. Starting salary $300 to $350 per month depending on exp. Write directly to Employment Director, P.O. Box 1663, Los Alamos, N.M.

MECHANICAL ENGINEER: With college degree needed by Pacific Northwest university in machine tool lab. Actual machine shop exp. and an understanding of tooling essential. Successful applicant will have charge of laboratory. Box 2-45.

Foreign

METALLURGIST: To take charge of well-equipped lab. in Catavi, Bolivia. At least 2 to 3 yr. exp. in lab. work necessary. Three-year contract will be offered with transportation to Bolivia paid by corporation. Box 2-50.

POSITIONS WANTED

METALLOGRAPHER — METALLURGIST: Age 35. Agreeable personality. First-class scholastic training and 15 yr. exp. in metallography and phys. met. 12 yr. in steel production met. 3 yr. in high-temperature alloy and miscellaneous metallography. Can prove ability to cooperate with others and supply recommendations by qualified persons. Present position as assistant to chief metallurgist. Prefers production to research. Box 2-55.

CHIEF INSPECTOR — DIRECTOR OF QUALITY CONTROL: Grad. met. eng. Age 30. Well-rounded mech., metallurgical and inspection exp. Good organizer, supervisor and contact man. Prefers to locate in Midwest or East. Presently holds above position, but desires to relocate. Box 2-60.

MECHANICAL ENGINEER: Case grad. Age 26. Registered professional engineer and member of Sigma Xi. 3 yr. research and development of ferrous plate; 2 yr. plant metallurgist ferrous sheet metal products—complete management of metallurgical division. Interested in joining medium sized company in sales eng. liaison or sales eng. capacity. Box 2-65.

METALLURGIST: Degree in met. eng., 1942. Desires position as research metallurgist or sales eng. in small or medium sized company. 5 yr. exp., including 2 yr. of phys. testing, metallography, and radiography and 3 yr. of research on applications of stainless steels. Prefers Texas or East. Free to travel. Good technical writer. Box 2-70.

PROFESSOR OF METALLURGY: Broad educational and industrial exp. Teach physical met., metallography, ferrous met., met. eng. and heat treating. Licensed professional engineer. Prefers mid-eastern, eastern or southern states. Box 2-75.

METALLURGICAL ENGINEER: Grad. B.S., registered professional engineer. Wide exp. in heat treatment production, tool and die steels, familiar with all types treating equipment. Specification of materials, process eng., welding, forging, casting of light metals, induction heating. Desires permanent position as chief or asst. metallurgist, or sales engineer with going concern. Preferably West Coast or Midwest. Box 2-80.

CHEMICAL-METALLURGICAL ENGINEER: Age 27. B.S. and M.S. in chem. eng. Currently candidate for Ph.D. with research on met. of gold alloys. 4 yr. industrial met. exp. including plant instrumentation, production control, heat treatment, metallography, phys. testing, design and development, machine tools. Fellowship student with teaching exp. Available in August. Box 2-85.

CHEMICAL-METALLURGICAL ENGINEER: 25 yr. industrial exp. Interested in position dealing with steel sales service, purchasing, or management. Northern Ohio location preferred. Available immediately. Box 2-90.

METALLURGICAL ENGINEER: Age 28, married. Grad. of Rensselaer Polytechnic Institute, 1941. 6½ yr. exp. in mill and lab. of steel and brass plants and general mfg. Thoroughly familiar with phys. testing and heat treatment. Desires responsible metallurgical position. Location immaterial. Box 2-95.

METALLURGIST: Age 26, married. Grad. met. eng. 2½ yr. exp. in mill and industrial plant, including heat treatment, metallography, phys. testing, failure investigation, report and specification writing, trouble shooting, research, development of carbon, alloy, die, and stainless steels. Desires responsible position as metallurgist, contact, or sales engineer. East Coast or Chicago area preferred. Box 2-100.

METALLURGIST: M.S. in organic chem. with 12 yr. exp. in chem. and chem. engineering. 8 yr. exp. in metallurgy, trouble shooting in ferrous and nonferrous fields, castings, stampings, forgings, machining, welding, electroplating, heat treating, and cleaning. Spectroscopy. Desires responsible position with a future. Age 42, married. Northern Ohio preferred. References. Box 2-105.

METALLURGIST—CHEMIST: B.S. Most recently asst. director of research. 17 yr. exp. as spectroscopist, chief analytical chemist, metallographer. Production exp. in heat treating, electroplating, forging, rolling, stamping, precision casting, die casting. Desires responsible position with reputable firm in metropolitan New York. Box 2-110.

TOOL AND DIE HEAT TREATER: 25 yr. exp. in steel plants, auto plants and jobbing shops. Prefers the South. References. Box 2-115.

METALLURGICAL ENGINEER: B.S., M.S. Age 38, married. Extensive, diversified exp. in jobbing shop problems including ferrous and nonferrous fdry. techniques. Past exp. as executive, administrative metallurgist in lab. supervision, general metallurgical responsibilities. Proven ability in development work affecting cost factors. Patented processes in casting and strip bonding. Highest references. Location immaterial. Box 2-120.

PHYSICAL METALLURGIST: With Ph.D. in met. eng. desires position as full professor or dept. head or chairman. Has had wide industrial exp. and is a capable teacher. Academic and industrial references. Location is secondary. Available for fall semester 1948. Box 2-125.

MANAGER OF SALES AND TECHNICAL SERVICE: Of metal manufacturing company. Exp. in ferrous and nonferrous metals. Outstanding record of increasing business from old customers, developing new customers for existing applications and developing new applications for both heavy and light metals in all forms. Exp. in selling direct or through distributors, warehousing, market research, merchandising, advertising, preparation of technical lit. and supervision of technical service. Box 2-130.

METALLURGICAL ENGINEER: Age 30, married. B.S. in met. from M.I.T. M.S. in mech. eng. 6 yr. diversified supervisory exp. in ferrous, nonferrous heat treating, materials control, metallography. Development and process eng., report and specification writing. Desires responsible met. position. Starting salary secondary to promising future in permanent position. Box 2-135.

METALLURGIST: Age 28, married, child. B.S. in 1941. 5 yr. of exp., 2½ yr. in major aircraft plant in inspection and research problems as lab. metallurgist, balance in process research and development for major welding company. Completely familiar with all phys. testing, metallurgical, heat treat and radiographic equipment. Crack metallographer. Varied nature of duties has given versatility that qualifies for charge of lab. or test section. Box 2-140.

DIRECTOR OF RESEARCH: Available for appointment. B.E., M.S., Ph.D. degrees in met. and M.E. in aeronautics (jet propulsion major). 8 yr. in industry and 2½ yr. in Navy on guided missile programs. Seeks executive position where organizational and administrative talents may be used. Box 2-145.